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Large Steel Output Under Handicaps

Double Standard of Prices and a Scarcity Market for Most of 1920—Depression Comes in October and Increases to the End of the Year

THE most surprising thing about 1920 in the steel industry was the size of the output. From beginning to end producers contended with one serious impediment after another. The year also will stand out in the annals of the industry for the maintenance over nearly 11 months of two sets of prices which, in different products, were from $10 to $30 or more apart.

On the one hand, the Steel Corporation, making nearly 50 per cent of all the steel sold throughout the year, held to the so-called Industrial Board prices which were announced on March 21, 1919. The independent companies in all cases secured higher prices. There was a scarcity of steel for nine months of the year and the independent companies at times found buyers actually bidding up the market to secure early delivery.

While the Steel Corporation sold bars, plates and shapes—the three leading products—at 2.35c., 2.65c. and 2.45c., Pittsburgh, respectively, the independent companies were able to get, through most of the year, from 3c. to 4c. for bars, 3.25c. to 4c. for plates and 3c. to 3.50c. for structural shapes.

1920 in Iron and Steel

Production was nearly 20 per cent more than in 1919 and only seven per cent less than the average for the great war years, 1916, 1917 and 1918. Pig iron output was about 36¾ million tons and steel ingot and castings output about 41 million tons.

Steel prices advanced steadily in the first four months. A few products went higher later. Automobile works slackened in June and later other buyers of steel slowed down. Cancellations came thick and fast in October and November, and in late November independent steel companies reduced nearly all their prices to the level the Steel Corporation had maintained from March 21, 1919.

The switchmen's strike in April caused a serious blockade. Steel mills were crippled for weeks. Many hundred thousand tons of rolled steel was held up at the mills, the total at one time reaching 2,000,000 tons. Fuel scarcity and high coke prices ruled for nearly ten months of the year.

The year ended with the Steel Corporation operating at 85 to 90 per cent. Independent steel companies, having long sought prompt rather than contract business, had little work ahead and were averaging less than one half the Steel Corporation output.

The Double Standard of Prices

This price situation was unparalleled. It would not be true to say that the products of the independent mills in 1920 brought from $10 to $30 a ton more than the average of the prices charged by the Steel Corporation. The fact was that some of the independent companies, before 1920 came in, had made large sales for delivery in the first quarter or first half of the year at considerably less than the market prices ruling when such product was delivered. The very high prices of the year—such, for example, as 4c. for plates and shapes and 8.50c. for No. 28 black sheets (against 4.35c. as the Steel Corporation price)—were realized on but a moderate percentage of the year's business.

What happened was that buyers, in view of the scarcity of steel created by the steel strike of 1919, placed orders with two and sometimes three producers. The Steel Corporation had a certain capacity and it had its regular customers. Its prices were attractive; but it had sold farther ahead than the independents in 1919 and entered last year with 8,265,000 tons of unfilled orders on its books. It was not in position to take on prompt delivery business.

In April, 1920, came the switchmen's strike, which quickly deranged the railroad systems and blocked the movement of steel throughout the country, particularly in the Pittsburgh district. Its serious effects on production and distribution are referred to farther on. It caused even a more frantic scramble of buyers.

It can never be known how far consumers whose deliveries had been set back by the steel strike received their due proportion of mill products in the first half of 1920. But the duplication and triplication of orders in the effort to make sure of getting material did much to sweep the market off its feet. Automobile makers more than any other class were responsible for forcing up prices, many of them determining at all hazards to get steel. Their industry stands out in the record of the year as the one that intensified the apparent scarcity

of steel, that caused what were first premium prices to become the market level for early delivery and that later, when its own business began to recede, tried to force a readjustment of prices on automobile steel which led to widespread cancellations of steel orders in other metal-working industries.

Surprising Resistance to General Readjustment

There was a feeling in the steel industry, in the summer and early autumn, when other lines were slowing up because of the general strike of buyers against high prices, that for once steel was not a barometer of general trade. Declines in silk, cotton, rubber and wool, which started early in the year, caused a flurry in mercantile lines in May. The automobile slump started in June; but it was September before signs of reaction were noticed in steel. Many in the trade protested that these were not the beginnings of recession and that the industry would run at a good rate practically to the end of the year. October gave a blow to all such hopes. It was proved again that the industries of the country are bound together in a way that makes prosperity in one impossible alongside of depression in another. The steel industry's readjustment might lag a little behind that of others, but it was inevitable.

In early summer, when the automobile slackening started, it was pointed out that the amount of steel required in motor car manufacture was a small fraction of the total—probably not over 6 or 7 per cent. For a time agricultural implement manufacturers seemed likely to take up what slack resulted from the automobile depression. Later it was hoped that the railroads with their large advance in freight rates would be able to buy steel on a liberal scale. Neither of these hopes was realized. The implement makers did some buying, but very shortly the decline in grain markets foreshadowed reduced buying of implements. The railroads set to work to repair cars on an extensive scale and to make them carry heavier loads and travel farther in a day, so that the need of new cars was not as great as it had seemed.

Intimations of Approaching Change

In view of the general impression that the change in the rate of iron and steel buying in the latter part of the year was in the nature of a collapse, and that there was little advance indication of it, some quotations from THE IRON AGE'S market summary are in order. These show how cautious sentiment was growing in the industry as far back as August, though October is commonly considered the month of the sudden reckoning. On Aug. 5, when predictions of large railroad buying were flying about, our summary said that the steel trade, having indulged some ill-starred hopes of large railroad orders following the return of the roads in March, was chary of prophesying heavy buying as a result of the late August increase in freight rates. On Aug. 19 the market was reported less active, "due in part to the price uncertainties connected with the coming railroad freight advance and in part to the recession in the automobile and other industries." The report of Aug. 26 noted that more thought was being given by producers of steel to "the final effect on their own market of the changes going on in other industries." In the next two weeks (Sept. 2 and Sept. 9) conflicting tendencies were noted, causing a waiting market, and it was indicated that the Steel Corporation was not likely to raise its prices to cover the increase in freight rates on raw materials. It was said in the issue of Sept. 16 that the steel market was "drifting into quieter times." From that time on into December the weekly chronicle was progressively unfavorable.

Production

The output of iron and steel in 1920 was considerably more than in 1919 but fell below the average for the last two years of the war, 1917 and 1918. Pig iron production was about 36,250,000 tons and steel ingot and castings production probably around 41,000,000 tons. Comparison with the four preceding years is shown in the following:

	Pig Iron Gross Tons	Steel Ingots and Castings Gross Tons
1916	39,434,797	42,773,680
1917	38,621,216	45,060,607
1918	39,054,644	44,462,432
1919	31,015,364	34,671,232
1920	36,750,000*	41,000,000*

*Estimated.

Lake Superior iron ore shipments by water were 58,527,226 tons for the season of 1920, against 47,177,395 tons in 1919.

The situation as to output for 1920 was, briefly, that in the first half of the year demand was sufficient to keep blast furnaces and steel works going at capacity, but fuel supply was inadequate and the railroad strike in April cut down operations in all lines. Later railroad congestion interfered seriously with production, and in the last quarter, with demand falling off sharply, output declined.

There were no wide fluctuations in the number of active blast furnaces until October. The blowing out movement toward the end of the year, the railroad strike in the spring, the continued coke scarcity and the railroad entanglements of the summer months due to the handling of the fuel situation from Washington were the principal factors in limiting furnace operations. The variations in the pig iron production appear in the following statement of the number of furnaces in blast at the beginning of each month:

Jan. 1	2[illegible]	July 1	302
Feb. 1	290	Aug. 1	293
March 1	304	Sept. 1	311
April 1	312	Oct. 1	319
May 1	281	Nov. 1	285
June 1	295	Dec. 1	252

In October and November there was a net loss of sixty-seven furnaces. Except for the slump in the last quarter, the year's output of both pig iron and steel would have approximated closely that for 1917 or 1918.

Steel Corporation and "Independent" Prices

To the student of business history in the intensely interesting period following the signing of the armistice, the price policy of the United States Steel Corporation will appeal as an important factor. As stated in THE IRON AGE of Jan. 1, 1920, when it became plain that the steel that could be rolled before Jan. 1, 1920, would fall short of meeting deliveries due on 1919 contracts, the Steel Corporation rigidly held to the prices of March 21, 1919, which were those decided upon by the Industrial Board. So far as general agreement was concerned, they were abandoned after the refusal of the Railroad Administration early in April, 1919, to pay for rails the prices announced in the Industrial Board schedule—$45 for Bessemer and $47 for open-hearth rails at mill. For a time the independent mills generally adhered to the March 21 schedule, especially those which, owing to the steel strike and fuel scarcity, had large deliveries to make of steel booked at the Industrial Board prices. Some, however, which were not booked far ahead, soon began to ask higher prices and in the fall there were decided differences. By November some independents were asking from $18 to $20 more for steel bars than was the Steel Corporation, and by April, 1920, independent

prices were about $32 above the Steel Corporation on steel bars. On sheets the difference was not so marked until early in March, 1920, when it was about $30 on black sheets and by August it had gone to more than $70. The downward trend began to manifest itself distinctly in October, and by the middle of December the prices of independents and those of the Steel Corporation were again the same on all products except tubes and wire nails, on which the Corporation prices were adopted at the end of the year.

The accompanying chart shows the trend of prices on two important products, black sheets and steel bars. Necessarily, it does not fully picture the prices even on bars and sheets because extreme quotations on limited tonnages are not represented, the figures being taken from the weekly Comparison of Prices in THE IRON AGE. It is well known that in some cases, particularly on sheets, small tonnages were sold at much higher prices than indicated by the chart, while it is also true that some of the independent companies charged lower prices than are indicated by the curves for the independents on the chart. It should also be borne in mind that some of the independents in 1919 sold large tonnages by contract for delivery at considerably later periods.

Comment on the Two Policies

The policy of the Steel Corporation was naturally the subject of much discussion among manufacturers of iron and steel and their customers. Those who are particularly friendly to the Steel Corporation claimed for its price policy that it was highly beneficial to business, having had a stabilizing effect and having set an example of moderation in a time when there was a tendency, yielded to by many in the business world, to charge exorbitant prices.

Representatives of independent companies, on the other hand, have had no difficulty in presenting what they consider good reasons for their position. They point out that the Steel Corporation has numerous advantages which they do not enjoy, due partly to the large number, varied character and diverse geographical locations of the Steel Corporation's plants, which give it important advantages in freights under Pittsburgh basing, especially in view of the advances in freight rates during the past year which have greatly increased manufacturing costs on raw materials and semi-finished products. It is also pointed out that, while the Steel Corporation has maintained low prices on leading products, it has had good profits on various specialties which are seldom mentioned in market reports, and has also obtained higher than its domestic prices on iron and steel products which it has exported.

The interesting question which now confronts the trade is to what extent the prices of the independents and the Steel Corporation for this year will run along together and how soon independent producers will find it necessary to cut below the Steel Corporation prices. There is nothing to indicate that the Steel Corporation will change its prices in the near future. The con-

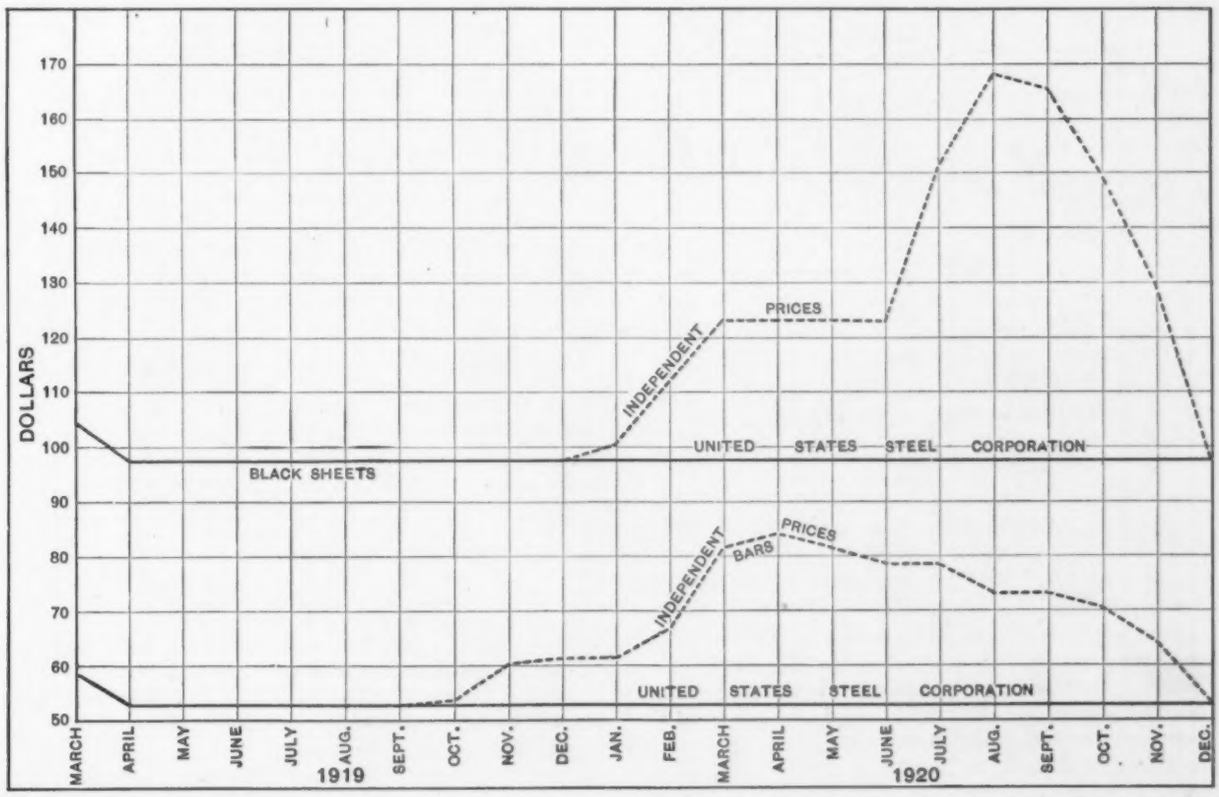
(*Continued on page* 45)

Independent Prices of Black Sheets, Tank Plates, Beams and Steel Bars, Gross Tons, March 21, 1919, *to Dec.* 16, 1920

1919	Black Sheets No. 28	Tank Plates	Beams	Steel Bars
April	$97.44	$59.36	$54.88	$52.64
May	97.44	59.36	54.88	52.64
June	97.44	59.36	54.88	52.64
July	97.44	59.36	54.88	52.64
August	97.44	59.36	54.88	52.64
September	97.44	56.67	54.88	52.64
October	97.44	58.46	54.88	53.54
November	97.44	59.36	54.88	60.26
December	97.44	59.36	54.88	61.60
1920				
January	100.24	60.93	55.33	61.60
February	112.00	78.40	60.48	67.20
March	123.20	81.31	70.11	81.31
April	123.20	84.00	72.80	84.00
May	123.20	84.00	69.44	81.31
June	123.00	79.52	69.44	78.40
July	151.20	75.71	69.44	78.40
August	168.00	72.80	69.44	72.80
September	165.20	72.80	69.44	72.80
October	149.85	69.22	68.32	70.11
November	129.24	62.94	64.74	64.28
December	97.44	59.36	54.88	52.64

Steel Corporation Prices, Gross Tons, March 21, 1919, *to Dec.* 16, 1920

Black Sheets	Tank Plates	Beams	Steel Bars
$97.44	$59.36	$54.88	$52.64



Prices of United States Steel Corporation and Independents on Black Sheets and Steel Bars, March 21, 1919, to December, 1920

New Charging Machine in Rundle Foundry

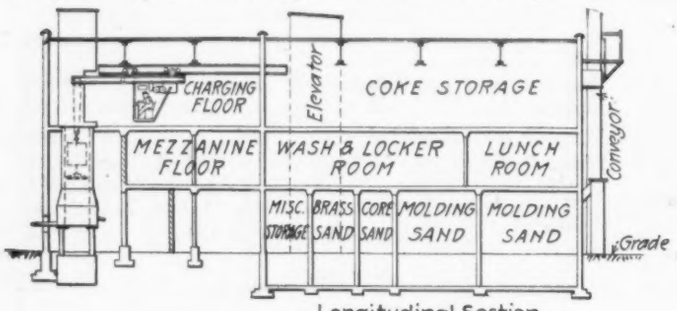
Milwaukee Plant Contains Numerous Novel Features in Design and Equipment—Sand Throwing Machine Cuts Down Molding Time

BY GILBERT L. LACHER

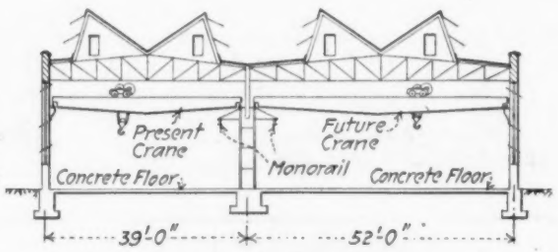
ONE of the difficulties encountered in designing cupola charging equipment is to secure an even distribution of the coke and metal. One method employed to overcome this obstacle has been to install two charging machines which feed the cupola from opposite sides of the shell. But even with such equipment a drop of several feet must be allowed from the point of discharge to the top of the last coke charge to obtain distribution. The disadvantage of this arrangement is that the full capacity of the cupola cannot be employed for the same height of charging floor unless manual labor supplements the machine; furthermore the drop from the machine to the coke charge tends to pulverize the coke unless hand charging is employed to bring the level of coke and iron up to normal maximum height. It was with the idea of surmounting these difficulties that the cupola charging machine now used by the Rundle Mfg. Co., Milwaukee, was designed.

The machine at the Rundle plant differs radically from previous designs. Instead of being stationary and operating on the side-dump principle, it is inserted into the cupola and lowered to a point close to the level of the bed charge before dropping its contents, and as succeeding amounts of coke and metal are charged the machine is lowered a correspondingly shorter distance. The machine is really an adaptation of the familiar bell hopper in a blast furnace. It consists of a cylindrical bucket, with a loose bottom in the shape of an inverted cone. When the bucket is to be discharged, the bottom is lowered while the cylinder remains in a fixed position, and the coke or metal slides off the cone to all sectors of the cupola. To insure a tight fit between the bottom and the bucket proper when closed, a band has been riveted on the outside of the bottom circumference, and the circumference of the cone has been provided with a depressed rim. The rivets in the bucket are countersunk on the inside so that no obstruction is offered to the easy movement of the contents.

The bucket is suspended by hoist from the arm of a Pawling & Harnischfeger 3-ton monorail

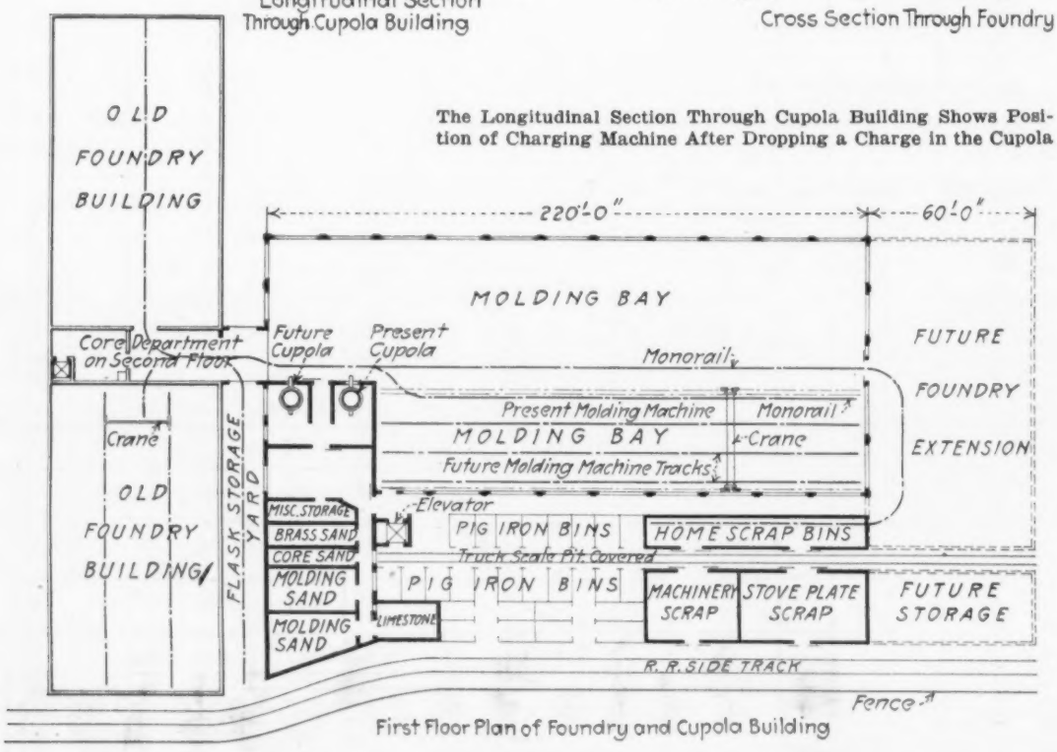


Longitudinal Section Through Cupola Building

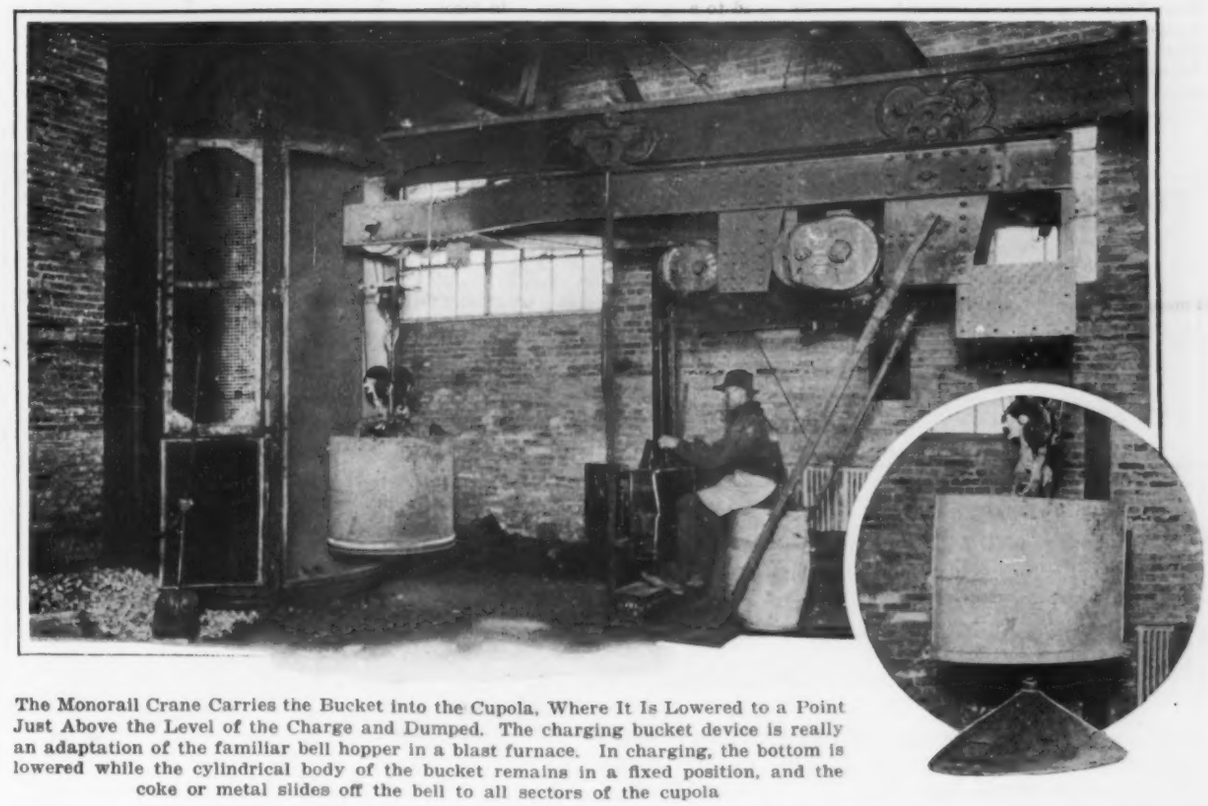


Cross Section Through Foundry

The Longitudinal Section Through Cupola Building Shows Position of Charging Machine After Dropping a Charge in the Cupola



First Floor Plan of Foundry and Cupola Building



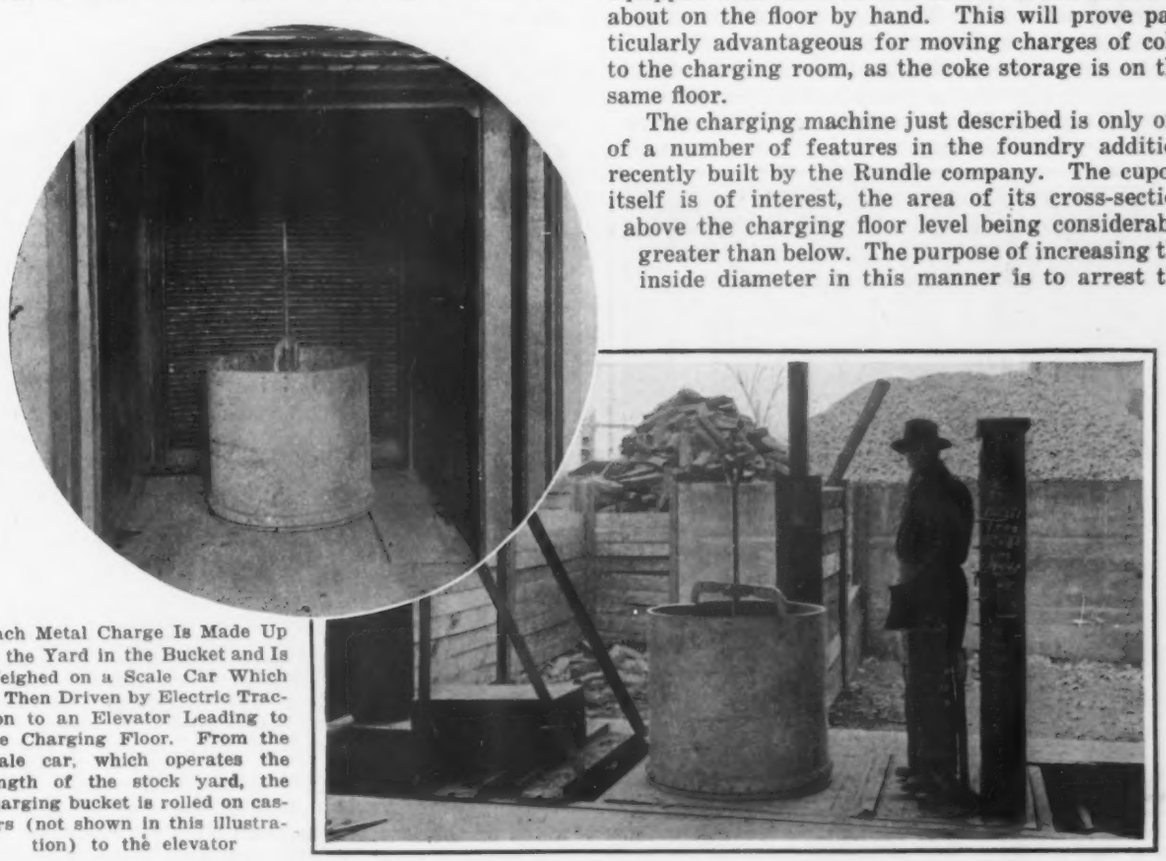
The Monorail Crane Carries the Bucket into the Cupola, Where It Is Lowered to a Point Just Above the Level of the Charge and Dumped. The charging bucket device is really an adaptation of the familiar bell hopper in a blast furnace. In charging, the bottom is lowered while the cylindrical body of the bucket remains in a fixed position, and the coke or metal slides off the bell to all sectors of the cupola

crane. A stop is provided on the exterior of the cupola so that when the arm of the crane strikes it the suspended bucket is exactly centered in the shell. The bucket is 36 in. in diameter (18 in. less than the interior of the cupola) and has a capacity of 2000 lb. of pig iron and scrap. Because of its design the bucket in discharging will not result in wearing the lining of the cupola at any one point; such wear as takes place is evenly distributed around the entire circumference.

The charging machine not only has the advantage in dollars and cents of saving labor but is superior to manual labor as a means of charging a cupola. Coke charged by hand is thrown in from the charging floor and when the bed is low, the fuel is apt to be broken and pulverized by the impact. When the charging machine is used, however, the bucket is lowered for discharge to a point just above the last material charged, no matter what may be its level.

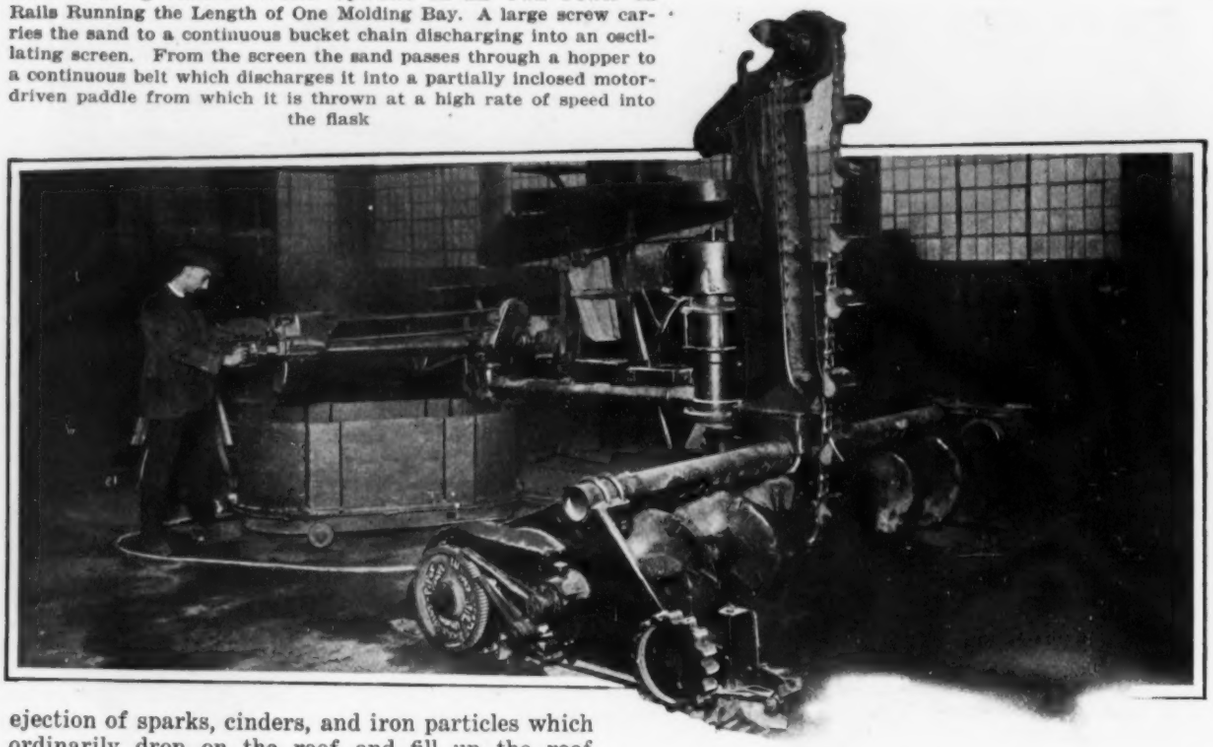
The charging bucket was designed and patented by G. Anderson, foundry superintendent Motor Castings Co., Milwaukee. Each of the buckets is equipped with three castors so that it can be moved about on the floor by hand. This will prove particularly advantageous for moving charges of coke to the charging room, as the coke storage is on the same floor.

The charging machine just described is only one of a number of features in the foundry addition recently built by the Rundle company. The cupola itself is of interest, the area of its cross-section above the charging floor level being considerably greater than below. The purpose of increasing the inside diameter in this manner is to arrest the



Each Metal Charge Is Made Up in the Yard in the Bucket and Is Weighed on a Scale Car Which Is Then Driven by Electric Traction to an Elevator Leading to the Charging Floor. From the scale car, which operates the length of the stock yard, the charging bucket is rolled on casters (not shown in this illustration) to the elevator

Sand-Throwing Machine Which Operates on Its Own Power on Rails Running the Length of One Molding Bay. A large screw carries the sand to a continuous bucket chain discharging into an oscillating screen. From the screen the sand passes through a hopper to a continuous belt which discharges it into a partially inclosed motor-driven paddle from which it is thrown at a high rate of speed into the flask



ejection of sparks, cinders, and iron particles which ordinarily drop on the roof and fill up the roof drains. The cupola was furnished by the W. W. Sly Mfg. Co., Cleveland. Blast is furnished by a belt-driven P. H. & F. M. Roots Co. blower, having a capacity of 38.5 cu. ft. per revolution. The blower is located on a mezzanine floor where space is provided for a future blower when a second cupola is installed.

The facilities provided for handling coke, pig iron, scrap, sand and clay from cars to foundry are worthy of attention. The stock yard, which lies between the long side of the foundry addition and a siding of the Chicago & Northwestern Railroad, consists of a double row of bins divided by a roofed-over depressed track which carries an electrically operated scale car. The bins are all designed to hold a carload of pig iron and those for purchased scrap, which are located next to railroad siding as contrasted with the company scrap bins which are on the other side of the scale car track, have a capacity of 175 tons each. In unloading, laborers transfer the pig iron from the car to a portable roller conveyor, placed between the car and the bin, over which the material slides by gravity to storage.

Hand Cable-Operated Cars Running on Rails Extending Across the Roof Truss Have Been Provided for Washing the Inside of the Roof Sash

An outstanding feature of the Rundle foundry is the fact that all metal charges are made up in the yard, and but one handling of the materials from bins to charging bucket is necessary. Incidentally, when a charge in a bucket is made up, the materials may be arranged in much the same fashion as is possible when hand charging a cupola. The arrangement in the bucket is duplicated in the arrangement of the materials in the cupola after the drop bottom is lowered.

The lack of order in the materials making up a given charge has been, in fact, one of the principal objections to mechanical cupola charging equipment. Other criticisms have been the danger of pulverizing the coke which, at best, reaches the foundry in too small a size, and the injury to the lining of the cupola which is concentrated at certain points. These objections have been overcome by the machine in the Rundle plant. It is also to be noted that such help as is necessary on the charging floor need not come close enough to the cupola while the blast is on to feel the extreme heat, as is the case with other charging devices. The time required to perform the various operations is short, and one machine could handle the charging of two cupolas of any diameter without reaching its capacity. The weight of the charge, whether one ton, or three, would be immaterial, provided necessary lifting power and adequate bucket capacity were provided. The operation of dropping the bottom of the bucket would be identical for a 1-ton or a 3-ton charge.

In the stock yard the charging bucket is placed on a scale car, which is moved by electric traction to any one of a long row of bins. Here the charge is made up, weighed on the scale, whence it is moved back to the foundry building where the bucket is transferred to an elevator and raised to the charging floor. Here the monorail crane picks it up preparatory to charging the cupola. Future plans of the company provide for the extension of the monorail out of the charging room into the

storage yard so that buckets may be hoisted direct from the yard. This will eliminate the transfer of the bucket from the elevator to the monorail crane. At the same time, the company will have provided itself with two means of moving the buckets to the charging room, so that should mechanical difficulties be encountered with either, an alternative method will be available. It should be noted that the floor of the storage yard is of concrete so that buckets may be manually moved on their castors to position under the monorail. The scale car was furnished by the J. C. Busch Co., Milwaukee, and the elevator by the F. Rosenberg Elevator Co., Milwaukee.

The same railroad siding which serves the storage yard is used for unloading cars of coke, sand and clay. The material is passed by chute from the cars into two continuous bucket elevators located on one end of the building, one elevator handling coke and the other sand and clay. From the conveyors the material is dropped on continuous horizontal belts which discharge into storage bins. The coke bins are on the same floor as the charging room, while the sand, clay and like materials bins are below. To secure required storage space the latter bins were sunk 6 ft. under the ground floor level. The conveying equipment was furnished by the Chain Belt Co., Milwaukee.

The new foundry of the Rundle company is particularly noteworthy because it has been equipped to reduce hand molding to the minimum. The extensive use of mechanical devices was feasible because the foundry is engaged in production work, the output of the company being bath tubs, wash bowls, sinks and other toilet room products. In fact, the molding practices of the company have been revolutionized largely through the use of one kind of machine, manufactured by Beardsley & Piper, Chicago. This device differs from the standard type of molding machine in that it throws the molding sand into the flask, and is therefore more properly termed a sand throwing machine. Its use eliminates all hand labor involved in shoveling sand into the flask and also involves no jolting, consequently causing no vibration of the floor of the foundry during operation. The machine is not confined in its use to bath tub molding, for which it is utilized in the Rundle foundry; on the contrary, it is being used by the International Harvester Co. at several plants for agricultural products, by American Steel Foundries for general work, and by other companies. It is not a special machine in the sense

Mixing Ladle Pouring into a Ladle Set in the Pouring Pit. Two 3000-lb. capacity motor-driven monorail hoists carry the iron to the molding floors

Coke, Sand and Clay Are Unloaded from Railroad Cars into Elevating Conveyors, Which Drop the Material on Continuous Horizontal Belts Feeding the Various Storage Bins

that it is limited to making molds within a small range of sizes, as is ordinarily true of the standard molding machine. It is manufactured in both stationary and mobile types, the Rundle company having both. The stationary machine, now situated in the smaller of two foundry bays, will be transferred to the larger bay. A traction type of machine operates on a track in the smaller bay and a second track has been provided on which another machine will be installed. The mobile machine is operated by motor on the principle of the pinion and rack, the teeth of the supporting wheels of the machine engaging teeth in the rails. The path between the rails, a distance of 11 ft., is heaped with molding sand and as the machine progresses, a large screw extending the width of the machine, carries the sand to a point midway in the track where a continuous bucket chain lifts it and discharges it into a screen on the molding side of the apparatus. It is to be noted that the conveying screw consists of two distinct and opposing parts, having right hand threading on one side and left hand threading on the other to insure the propulsion of the sand to the center where it is picked up by the bucket conveyor. A single 5-hp. motor performs the traction and operates the screw and bucket hoist.

The screen into which the bucket chain drops the sand, is oscillated by a 2-hp. motor, the refuse being drawn off by a chute to a box below and the screened sand dropping into a hopper and thence to a continuous belt. The sand is discharged by the belt into a partially inclosed motor-driven paddle which throws the sand at a high rate of speed into the cope or the drag below. The arm of the machine carrying the sand belt and paddle is pivoted on the arm supporting the screen oscillator. Hence the discharge spout of the machine can be moved to any position within a wide radius, the length of the adjustable arm being 11 ft. A 3-hp. motor operates both the belt and the paddle. The control of the machine is appropriately on the spout where the operator is at work. The drag and cope patterns and the bottom board are carried along by the machine on two trailing platforms, mounted on wheels.

At the conclusion of a day's molding when the machine has reached the end of the track, it is hoisted by overhead traveling crane and turned around so that it is ready to commence operations

in the opposite direction on the coming morning.

Before the machine was used in the Rundle plant it took a molder an average of 40 min. to ram a bath tub mold. The sand thrower does the work in 6 min. No hand ramming whatsoever is required with the new method, and because of the ability positively to control the force of the sand as thrown by the machine, the mold is uniformly hard throughout. This is distinctly advantageous, as it enables the company to cut down the weight of the tub. Weight, it should be noted, means nothing from a selling standpoint, as a heavier tub will bring no more than a lighter one if the dimensions are identical. At the same time, any saving in metal effected means a reduction in manufacturing and shipping costs. Absolute uniformity in ramming cannot be obtained by hand no matter how skillful the molder, if for no other reason than that he tires as the day progresses.

Other equipment in the foundry addition includes three molding machines manufactured by the Arcade Mfg. Co., Freeport, Ill. These are located in the larger bay, which is at present only about one-third equipped. Other standard type molding machines are to be installed and the stationary sand throwing machine now in use in the smaller bay will be moved to the large bay to make room for a second tractor type machine. A motor-driven sand cutter, furnished by the Sand Mixing Machine Co., New York, is also among the equipment now on the floor.

As previously indicated, the foundry addition constructed by the Rundle company consists of two parallel bays. The larger is 220 x 52 ft., and the smaller 180 x 39 ft. The cupola is located at the end of the small bay, this location being midway between the present addition and the two old foundry buildings. A monorail system extends from the cupola through the new bays and connects with a monorail in the older plant. Two 3000-lb. capacity motor-driven monorail hoists, manufactured by the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., serve the new and old foundries. In the smaller bay a 3-ton Pawling & Harnischfeger overhead travelling crane supplements the monorail system. The monorail connects with the storage yard, thus facilitating the movement of company scrap to the bins.

The Charles C. Kawin Co., foundry engineer, Under the tap hole of the cupola is a mixing ladle stand, in front of which is a pouring pit. The ladles are conveyed from the cupola to points where they are needed on the molding floor by the overhead monorail hoist.

The molding bays are well lighted. There is continuous sash in the side walls and the end of the building and in the M-type roof. The sash in the roof may be opened the entire length of the bay by chains operated from the floor. Ventilation may also be obtained by opening windows in the sash of the side walls. Artificial light is provided by incandescent electric globes in Maxolite reflectors hung from the roof trusses. There are 36 of these in the main bay and 24 in the smaller bay. The foundry is steam-heated, and air and water pipes have been provided on all the center columns, a most convenient location for use in either bay.

A large amount of steam and dust commonly rises from the foundry floor and clouds the inside of the roof sash, thereby shutting out much light. Unless a convenient means of cleaning the inside of the sash is provided, its advantage from a lighting standpoint is soon lost. In the new Rundle foundry a simple, yet ingenious, scheme to overcome this difficulty has been introduced. Rails have been extended across the roof truss next to the sash, and hand cable-operated cars have been provided for the window washers. At the end of the bays adjoining the roof of the cupola building are doors which give the washers easy access to the cars.

A core room and core ovens are located in the passageway connecting the new and old foundries on a level with the mezzanine floor under the charging room. Here is a Coleman rack oven, manufactured by the Foundry Equipment Co., Cleveland, and another oven which had been previously used in the old foundry. Over the top of the ovens are canopies with pent houses containing Ilg ventilating fans, which aid in the quick removal of the gases. The ovens are equipped to burn either gas or oil. Sand for the core room is mixed on the ground floor and carried by monorail to an elevator which raises it to the mezzanine floor, where a second monorail system carries it over the coremakers' benches. Adjoining the core room is a women's rest room which faces an outer court, 20 ft. in width, located between the old and new foundry structures. The new foundry has no cleaning room, the cleaning facilities of the older plant being used.

The Charles C. Kawin Co., foundry engineers, Chicago, had charge of the entire design and equipment of the Rundle plant. The building was constructed by Klug & Smith, contractors, Milwaukee.

The Stock Yard Lies Between a Railroad Siding and the New Foundry. The roof dividing the storage bins covers the scale car track. In the left background may be seen the monorail which serves the company scrap bins

A Specification for Cupola Semi-Steel

War and Other Uses of Such Castings —Control of Mixtures—Percentages of Steel for Various Classes of Product

BY Y. A. DYER

The legitimacy of the term semi-steel has been called in question. Mr. Dyer incidentally answers the objectors, but the main purpose of his article is to show to what extent semi-steel castings have become a factor in foundry output, and also what percentages of scrap in the cupola mixture have been found to add most strength and toughness to the casting and give other properties required in special uses.

THE principle and manufacture of cupola semi-steel are by no means new, but scientific application of standards to produce uniform mixtures, plus consistent cupola practice, is of comparatively recent date. Between 1846 and 1851 J. D. Stirling, of England, patented "Stirling's toughened cast iron"—a metal mixture composed of 20 to 30 per cent wrought iron and 80 to 70 per cent pig iron. Its transverse strength was 25 to 50 per cent more than that of ordinary gray iron, and the metal, it is reported, "enjoyed a wide reputation for increased tenacity, strength and toughness."

In 1876 S. M. Carpenter, of Cleveland, Ohio, patented for use in the United States a process of mixing steel scrap with pig iron by immersing the steel in liquid cast iron, thereby obtaining very satisfactory results. In 1885 Robert E. Masters of the Columbus Iron Works Co., Columbus, Ga., reported the successful use of as much as 83 1/3 per cent of steel scrap in mixtures for sundry castings.

Asa Whitney, of the Whitney Car Wheel Co., was a pioneer in the use of steel scrap in cast iron wheel mixtures, thus replacing to a large extent charcoal pig iron.

However, these uses of steel scrap in the foundry preceded what might be termed a general metallurgical working plan for foundry cupola mixtures and the success obtained was more or less haphazard.

Major McDowell's Work

To whom belongs the credit of first employing the term "semi-steel" is not definitely known, so far as the author's information extends, but it is a well-established fact that the late Major McDowell of Chicago, has the rightful claim to first honor in placing the process of producing semi-steel on a scientific basis. The writer has verified this statement by obtaining certain data from Robert Field, of Rome, Ga., pioneer pig iron salesman, who sold iron to and worked with many of the early foundrymen of the East and Middle West when mixing iron by analysis was in its infancy. Much credit is also due to David McLain, of Milwaukee., Wis., for his exploitation of the manufacture of semi-steel.

Semi-Steel Shells

The greatest impetus added to the use of semi-steel was attained during the world war, especially after the discovery behind British and French lines of the so-called "mysteriously toughened cast iron" shells made use of by the Germans. Shortly afterward the author was called upon by a large English iron and steel company to supply data and specifications for the manufacture of "semi-steel," as well as specifications for the erection of a 36-in. and 48-in. cupola, according to American design as to comparative areas, etc. Inasmuch as the steel business was taxed to its utmost capacity during the war, there was a pressing need for a metal stronger than usual cast iron specifications, to assist in supplementing the steel supply.

The American Radiator Co., through its metallurgical and research department, added valuable data on the subject of properties and manufacture of semi-steel. This company manufactured thousands of tons of semi-steel shells for the American Government and allies, and spared no expense in its preparation for the manufacture of finishing of such shells. Under the title "Semi-Steel Tests" some interesting data were recently prepared and given out by this company's metallurgical department.

Properties and Basis for Nomenclature

Constitutionally semi-steel may be classed as "low carbon cast iron"—steel being used in the capacity of a ferroalloy to accomplish the desired results. Strictly speaking an "alloy" is used in a mixture to add a desired element, to flux an undesirable element, oxidize or neutralize certain harmful gases and residual oxides. In the case of semi-steel mixtures scrap steel is used as an "alloy" to reduce the percentage of certain elements—silicon (total), carbon, sulphur and phosphorus—and thereby impart to the metal certain characteristics through the ultimate form of carbon-alloys.

About 2 per cent total carbon is generally recognized as being the separating line between the characteristics of steel and cast iron. However, a cast iron which would closely approach such a total carbon would have a very limited demand to supply, on account of its extreme hardness and brittleness. Total carbon around 2.80 per cent, with other elements well regulated and balanced, practically marks the same limit of carbon reduction for serviceable cast iron which is required to permit of machinability.

In semi-steel of quality it is necessary to reduce to comparatively low limits the total carbon and silicon, and yet have the casting maintain the machinable nature of gray iron. The strengthening qualities of semi-steel must depend on the proper balancing of the sulphur, phosphorus and manganese. These factors, together with the lowering of silicon, must have their bearing on keeping the graphitic carbon comparatively low (2.40 to 2.45 per cent) and the flakes broken down to a small size. The combined carbon should range between 0.75 and 0.80 per cent. The rate and uniformity of cooling will also have a direct bearing on the size of graphite flakes.

Kirk says: "Steel is a far greater and cheaper controller of cast iron than any metalloid or ferro-

alloy." The writer fully concurs with Mr. Kirk, and for the past ten years has ardently applied the sound principles enunciated by him. Thus the name semi-steel becomes purely a commercial one, based on steel being used in the sense of a ferroalloy. Who objects to the commercial name of "nickel steel," "chrome steel," "manganese steel" and others of the alloy family? Some have claimed that semi-steel is a misnomer from the fact that its properties do not resemble those of steel, and therefore that prospective purchasers are duped into believing that they are getting a costlier and better article. The answer to this argument is that nickel-steel has none of the properties of nickel, neither has manganese steel any of the properties of manganese—yet by alloying these elements with steel a superior steel product is obtained and a higher price is paid for them by reason of superior qualities which adapt them to a peculiar service. There is no sound argument against superior quality of semi-steel as compared with gray iron, and thus far steel is recognized as being the best known "alloy" for transmitting to gray iron the qualities in queston.

A Call for Standards

The successful and scientific mixture of steel scrap with pig iron and cast scrap in the cupola has been so misunderstood and abused that there would seem to be a call for standard "semi-steel" specifications. Such action would settle once for all any quibbling as to a distinctive trade name. It has been suggested in American Foundrymen's Association circles that a definite standard for semi-steel castings be formulated, but thus far no official action has been taken. The writer submits to the foundrymen for their consideration the following minimum requirements to be approximated in the manufacture of semi-steel castings—based on the present standard "arbitration bar":

	Per Cent Steel	Transverse Strength	Tensile Strength
Light castings	15 to 19	3,200 lb.	32,000 lb.
Medium castings	20 to 29	3,400 lb.	34,000 lb.
Heavy castings	30 to 40	3,700 lb.	37,000 lb.

Control of Mixture

The control of chemical mixtures is of prime importance, linked very carefully with cupola control. In the matter of strength, of course, it should be the aim of the foundryman to reduce the total carbon and silicon; but this practice will be largely controlled by the size of the casting to be poured. The silicon will yield more readily to control than the carbon, from the fact that its oxidation is more or less uniform while the carbon loss or gain through the cupola is more uncertain. As long as the total carbon is kept low the tendency of the ultimate carbon-alloy is toward the combined state. Therefore, if the carbon lowers and there is a tendency to chill the casting, the silicon may be raised without detriment to the combined carbon, provided due care is given to the matter of uniformity of cooling rate. The phosphorus should be kept low for strong and tough castings. Manganese may range from 0.45 to 1 per cent, depending on the size and nature of the casting. The sulphur should be kept between 0.07 and 0.11 per cent in small, medium and heavy castings.

To produce satisfactory semi-steel castings and minimize uniform fusing and intermixing of pig iron, cast scrap and steel scrap, a clear understanding should be had as to the proper kind of pig iron and cast and steel scrap best suited for this class of work, and the correct proportions it is safe to use. The pig iron should be low in phosphorus—0.25 to 0.50 per cent, depending on the size of the casting; manganese, 0.80 to 1.25 per cent; sulphur, under 0.05 per cent. The silicon content may be selected with reference to the character of the cast scrap available for use. Silicon 2 to 2.50 per cent will usually cover all requirements. It is more desirable to purchase a pig iron which carries sufficient manganese than to resort to the use of ferromanganese. High grade agricultural or machinery scrap of low silicon content (1.75 to 2 per cent) is desirable, provided sufficient domestic or remelt scrap is not available. If very low silicon should be desired in a casting, from 10 to 12 per cent of car wheel scrap may be used to good advantage. Low carbon or soft steel is preferable—such as plate, structural, agricultural, railroad and machinery steel castings. Steel rails, especially smaller sizes, may be used with good results. High carbon steel, wrought iron and malleable scrap are considered undesirable.

Steel Percentages for Varying Usages

From 15 to 40 per cent of steel scrap may be safely used in mixtures, depending on size of castings, etc. After determining the desired percentage of steel in a mixture, it is highly necessary that each charge thereof should be carefully weighed, as well as other metals in the mix. Too large and irregular stock should not be charged, as hang-ups and erratic melting are likely to result. Flat steel should be "cupped" before being charged, so as to permit the free circulation of cupola gases. Very light, corroded or pitted steel should not be used. Steel should be charged on coke bed, followed by pig, then cast scrap on top.

There are very few mixtures in which steel cannot be used to decided advantage, and when properly used there is produced an extraordinarily strong, tough and easily machined casting which will register tensile and transverse ranges far beyond gray iron. Therefore the weight and section of many castings may be materially reduced without sacrificing strength. Automobile cylinders cast en bloc or in individual units require a metal of these extraordinary characteristics. By reason of extreme liability to expansion and contraction, due to heat of the combustion chamber, the cylinder should be made of a metal low in expansion and contraction. Internal combustion pistons should be made of like material so as to insure their holding compression at all engine temperatures and prevent either a binding effect on expanding or a flapping effect on contracting. Piston rings should be of the very best material so as to prevent seepage of fuel into the crank case, thereby diluting the oil. Bronze and aluminum bearings expand and contract easily, thereby producing a binding or "pinching" of the crankshaft. Bearings backed up with cast iron, which varies almost exactly as the steel crank shaft, allow uniform bearing clearance at all temperatures and engine speeds. All of the above conditions may be ideally met by the use of semi-steel castings, and they are very generally in vogue. In fact, the manufacture of cylinders, electrical castings, machinery and all high duty castings is

(*Continued on page* 104)

Blast Furnace Gas Cleaning Equipment

Three Dry Method Stages at Rouge Plant, Ford Motor Co.—New Method of Taking Gas Samples—Results of Tests

BY L. B. BREEDLOVE*

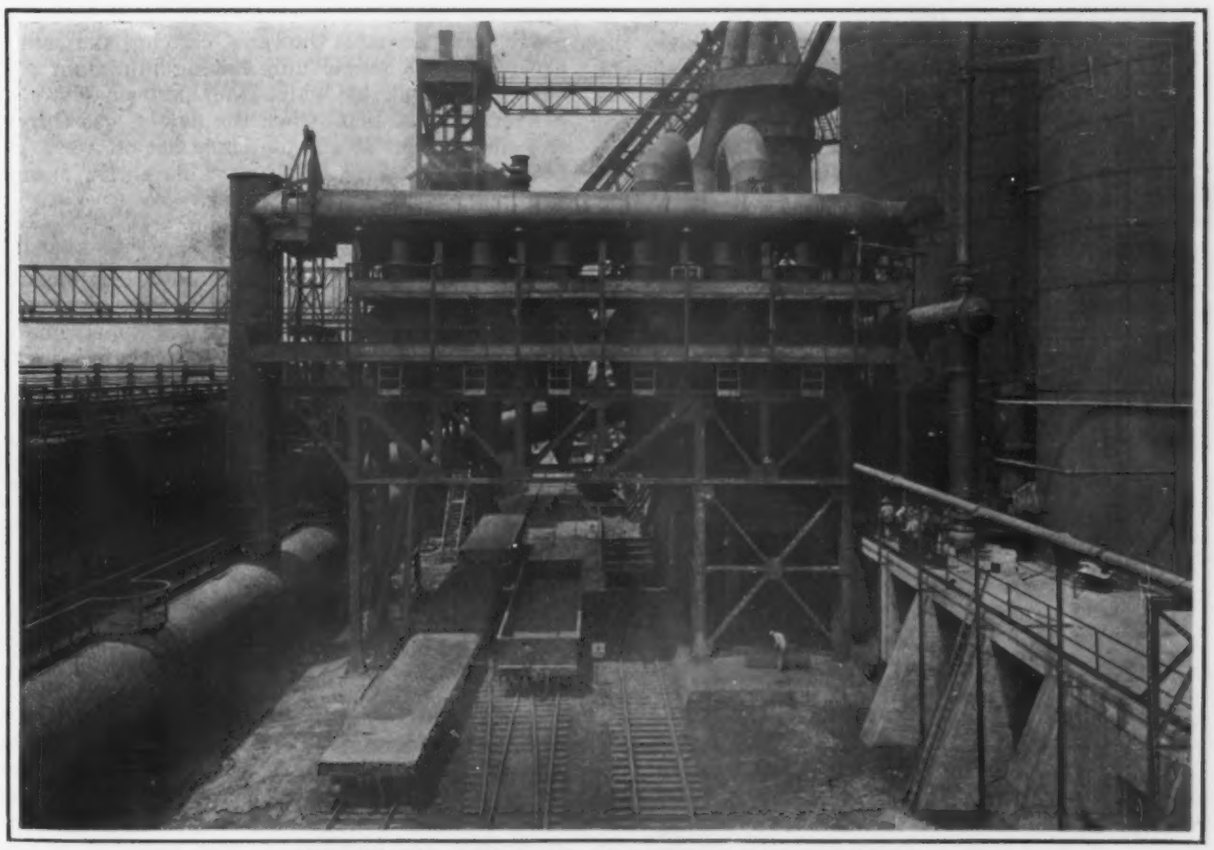
THE blast furnace department of the Ford Motor Co. is located at the new Rouge River site, where it is intended to develop the vast activities of the Ford company in the future. The new foundry in fact is being pushed forward simultaneously with the blast furnace plant. Therefore, the power requirements are obviously very much in excess of the ordinary power requirements about an isolated blast furnace plant, and in studying the situation the Ford organization realized the tremendous possibilities of developing power from the blast furnace gas available, providing it was handled in an economical fashion. It was, of course, appreciated that the gas to be fired economically under the 2647-hp. boilers must be cleaned in some manner. The firing of the blast furnace gas under the boiler equipment will, of course, be supplemented by other fuel, it being estimated that the gas from one furnace will supply one boiler at approximately 150 per cent of rating, while all loads above this, up to a maximum of 450 per cent of rating, will be carried by pulverized coal, this flexible arrangement resulting in an excellent overall efficiency.

The original plans were to install in series with the rest of the gas-cleaning equipment a cleaner operating on the ordinary wet cold principle. However, it was appreciated that if a suitable cleaner operating on the dry hot method could be obtained, the gains would be many fold. The sensible heat of the gas, which is of great value, would be retained. The highest possible stove and boiler efficiency would be obtained. The dust and fumes precipitated would be recovered in a dry state. The annoyance of sludge in the mains, burners, etc., would be eliminated. The pollution of water supply would be obviated, etc. With this in mind, all types of cleaners then in operation were investigated by this organization, practically all being tested, and from this information the Kling-Weidlein dry gas cleaners were chosen.

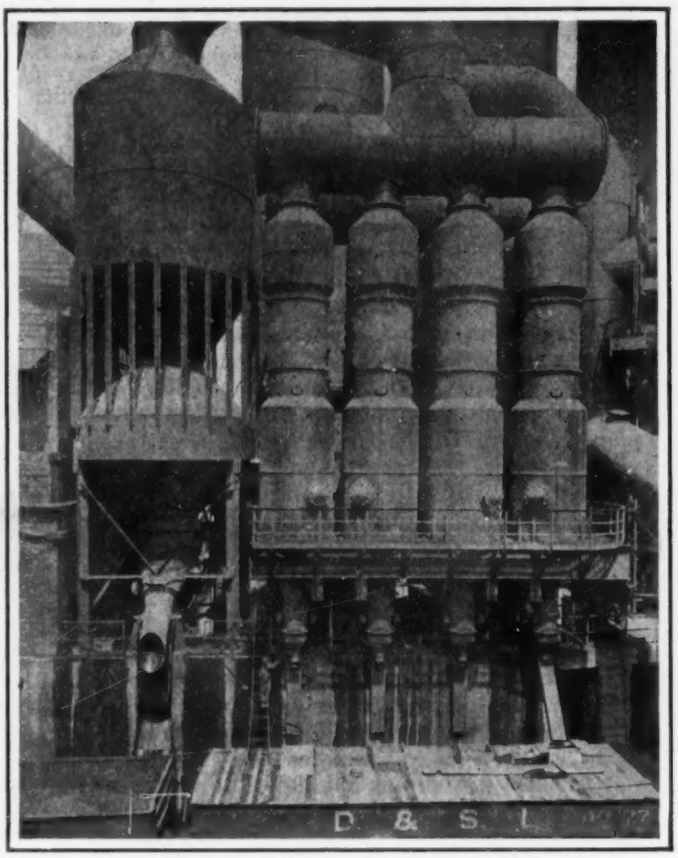
Every precaution in laying out the gas system between the furnace and the final gas-cleaning apparatus was taken to insure a minimum amount of dust content in the gas. The top of the furnace is equipped with a patented downcomer connection of Julian Kennedy design, whereby the gas is taken vertically upward for a certain distance and two downcomers brought together through a special casting before being taken downward from the furnace. The elbow casting just mentioned is of such design that it throws a large portion of the larger particles of coke being carried by the gas back into the furnace.

The downcomers coming away from the furnace, two in number, connect to a dust catcher of the hour glass design as developed by Julian Kennedy. This dust catcher has an inside diameter of 18 ft. in the upper shell, tapering to an inside diameter of 4 ft. 10 in. and then out in the lower

*Plant engineering department, Rouge plant, Ford Motor Co., Dearborn, Mich.



Kling Weidlein Dry Gas Cleaner Spanning the Railroad Tracks



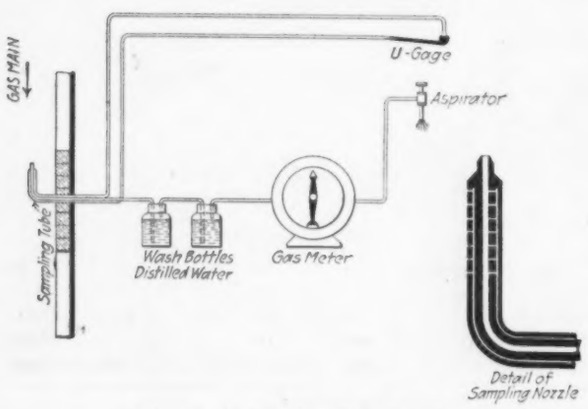
From the Dust Catcher on the Left the Gas Goes to the Whirlers and Then Through the Third Stage, This Apparatus Extending at Right Angles Across the Tracks, as Shown in the Continued View on the Facing Page

part of the hour glass to a diameter of 18 ft. Thus any dust taken out by the dust catcher is thrown down through the neck of the hour glass into the lower hopper, which insures that it will not be again taken up by the gas in passing through the dust catcher.

From the dust catcher the gas is carried through a gooseneck to a bank of whirlies, also of Julian Kennedy design. This bank of whirlies is situated on the stove platform, consisting of twelve units arranged in four parallel rows, there being three rows in series. The diameters of the whirlie throat castings are 3 ft. 3 in. inside and 5 ft. 5 in. outside.

The gas on leaving the whirlies enters the Kling-Weidlein dry gas cleaner. The clean gas manifold of this cleaner is connected at one end to the stove gas main and at the other end to the gas main leading to the boiler house, a distance of about 250 ft. In view of this length of gas main it was obviously desirable to have the final cleaning equipment located as near the furnace as possible, thus eliminating the necessity of cleaning out any long lengths of dirty gas main. This necessitated the supporting of the six cleaner bodies of the dry gas cleaner on two through trusses, having three columns, each spanning the railroad tracks instead of the usual multi-column structural support. This change in the supporting structure necessarily increased the amount of steel required by a considerable amount over and above the standard form of support, but the advantages to be gained were considered to be sufficient to offset the high cost.

The dry gas cleaner is built on the unit construction plan, and while the manufacturer of this equipment claims a unit capacity of 10,000 to 12,000 cu. ft. of gas per unit per minute, which in our case would require but five units, it was deemed desirable after careful consideration by our engineering department, to install one additional unit for the reason that this not only provides a spare unit in case of emergency, but also had the advantage of giving a possible better cleaning efficiency when all six units are in operation, inasmuch as each unit would be required to handle a slightly less volume of gas per minute. Each unit is equipped with the manufacturer's standard steel wool mat and the combined area of the six units exposed to the gas is 768 sq. ft. The shaking mechanism is located in a pent house directly above the cleaner bodies and is driven by a high speed shaft running lengthwise of the pent house. The automatic operation is obtained from a high-speed shaft which actuates the cams, clutches and shakers arranged in a single unit having minimum parts over each shell, by which the hammer blows are delivered to the mats when the flow of gas through one cleaner unit is automatically cut off for a predetermined interval of time. This entire mechanism is driven by a 10-hp. motor.



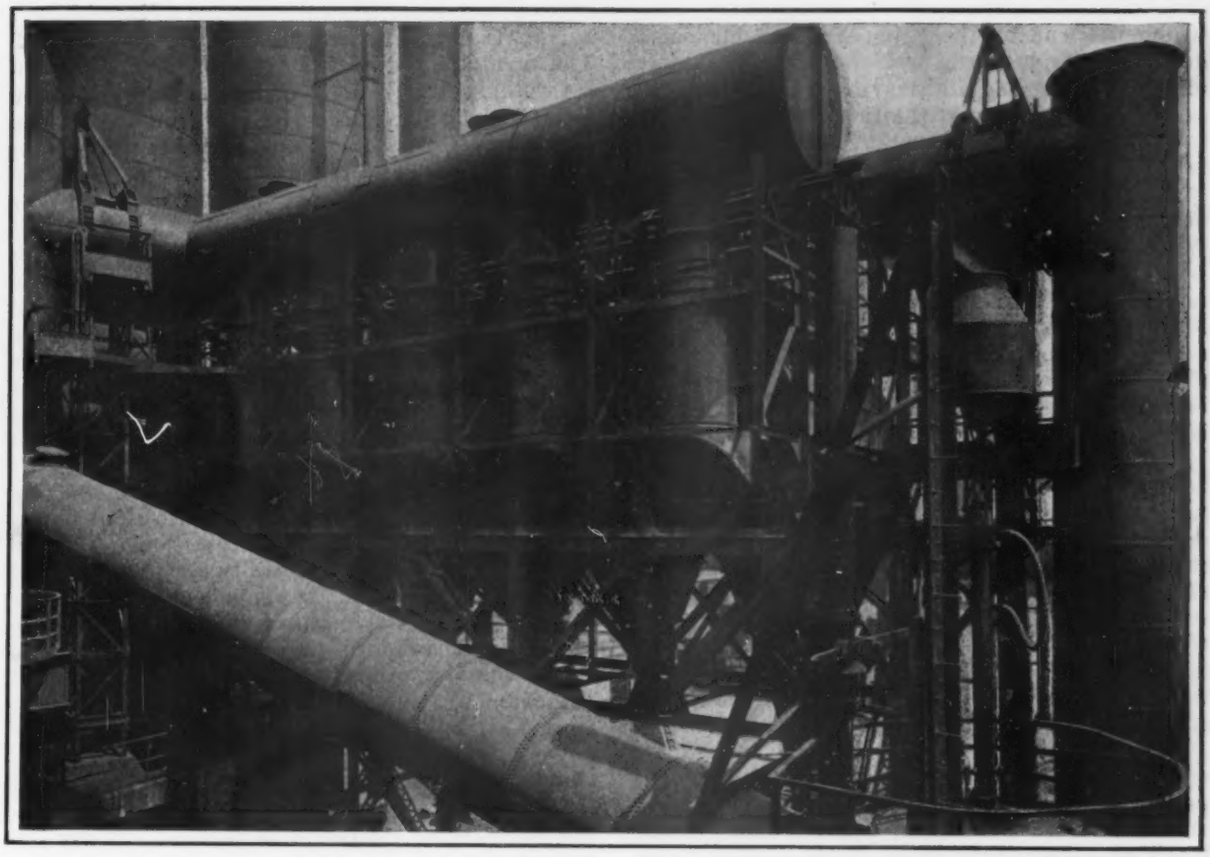
Scheme of Securing Gas Samples

Previous to operation, opinions on the amount of the dust that would be recovered by the various devices included in the complete gas-cleaning equipment showed considerable variation. After the plant had been in operation approximately four months, a test was made to determine the amount of dust removed from the gas by the three different stages of cleaning—namely, the dust catcher, whirlies and the Kling-Weidlein final cleaning equipment. At the time this test was made, the furnace was averaging 415 tons of 3 to 5 per cent silicon foundry iron. The blast volume was approximately 38,999 cu. ft. of free air per minute.

The following results were obtained:

Equipment	Dust, Lb. 24 Str.	Per Cent by Weight	Lb. per Cu. Ft.	Total Cu. Ft.	Per Cent by Volume
Dust catcher....	17,000	25	99	171	18.2
Whirlies	38,300	56	92½	414	43.9
Kling-Weidlein..	12,700	18	35½	358	38.0

This test was conducted with great care, but under the conditions a portion of the very light and fluffy material removed in the Kling-Weidlein cleaner escaped. No effort was made to measure accurately the amount of dust removed in each bank of whirlies respectively. However, it was



clearly shown that the greatest portion of the dust removed by the 12 units of the whirlies was accomplished in the bank nearest the furnace, while the last bank recovered practically none. In this installation the whirlies apparently act as a primary cleaner and there exists a question as to whether or not they are necessary in front of the Kling-Weidlein cleaner.

It was the intention at one time to install a connection in the gas mains in such a manner that the whirlies might be shunted out of service in order that experimental data on this question might be obtained. However, due to the short time available on the construction program, this was not done. Tests on other Kling-Weidlein dry gas cleaner installations, where the cleaner is connected directly to the dust catcher (without whirlies between) would indicate that the whirlies might be unnecessary. These installations, however, all have a larger dust catcher. A difference of opinion apparently exists as to the proper size of dust catcher. Inquiry made would indicate the majority seems to be in favor of one of larger diameter, possibly 26 to 30 ft.

The mats in the Kling-Weidlein cleaner are packed in three layers. The bottom layer is 6 in. of unit density; the next layer, 4½ in. thick, is of 150 per cent unit density, and the top layer, 3 in. in thickness, of 200 per cent unit density. Each layer is separated from the other by a steel screen made up of ½-in. rounds with a 2⅞-in. square mesh. The function of these steel screens is twofold—namely, that of separating the layers and of distributing the blow of the shaker over the entire area of the mats.

When this cleaner was first put in operation the pressure loss through the mats rose slowly to 8 or 10 in. of water, but it was found upon investigation to be due principally to an error in the design of the yokes which transmitted the hammer blow to the mats, and to numerous mechanical inaccuracies. The original yokes were of such construction that they deflected sufficiently at each hammer blow to decrease materially the effectiveness and sharpness of the blow. After this error in design was corrected and the usual mechanical tuning up of a new equipment was completed, the resistance through the mats dropped to ½ to ¾ in. of water, and has since remained constantly at this range.

At this point it might be well to call particular attention to the fact that in this final cleaning, where the very light and fluffy materials are removed, the drop in pressure through the equipment, or in other words, the back pressure thrown upon the furnace, is but a small fraction of that caused by the other cleaning stages. For instance, the average pressure drop through the dust catcher is from ¾ to 1½ in., and the pressure loss through the whirlie units is from 12 to 15 in.

Test of Kling-Weidlein Dry Gas Cleaners

Date of test	Oct. 1, 1920
Duration of test, hr	5
Average quantity of gas cleaned (cu. ft. per min.)	49,200
Average quantity of gas samples (cu. ft. per min.)	12,500
Number of stoves in line	3
Boiler horsepower on line	3,000
Atmospheric temperature (deg. F.)	58
Barometer, in. of mercury	29.3
Power required to operate shaker (hp.): Start	4.8
Shaking	3.7
Idling	1.6
Number of cycles, shaking cleaners (per hour)	5
Temperature of gas before cleaner, deg. F.	350
Temperature of gas after cleaner, deg. F.	290
Temperature drop through cleaner, deg. F.	60
Static pressure before cleaner (in. of water)	19.2
Drop in pressure after cleaner (in. of water)	18.6
Dust content in gas before cleaner (gr. per cu. ft.) St. Gond.	1.03
Dust content in gas after cleaner (gr. per cu. ft.)	00.184
K_2O in dust before cleaner (gr. cu. ft.)	00.170
K_2O in dust after cleaner (gr. per cu. ft.)	00.041

Seive Test (Dust Removed by Cleaner)

On 100 mesh, per cent	37.70
On 200 mesh, per cent	31.30
On 300 mesh, per cent	12.98
Through 300 mesh, per cent	18.02

Seive Test (Dust Passing Through Cleaner)

Through 300 mesh, per cent	100

The following give the results of a 5-hr. test

which was run on the Kling-Weidlein cleaner to determine its performance. Continuous samples of the gas entering and leaving the cleaner were taken. During the test the furnace slipped twice, the snort valve being open both times. The readings were taken every ten minutes.

The method of taking the samples of gas is new and has been developed by this organization. When sampling a gas carrying dust, it is necessary to take the sample without changing the direction of the flow and at exactly the same velocity at which the gas is traveling. Otherwise the sample is not correct. This special type of sampling tube is made of ¼-in. seamless brass tubing bent to an angle of 90 deg., so that when the point is turned upstream a section of the area of the ¼-in. pipe is cut out of the main body of gas. Soldered to this ¼-in. tubing were two ⅛-in. brass tubes which were so arranged that a static opening leads into each of these tubes. One of these static openings leading direct from the outside measures the static pressure in the gas main itself. The other opening leading from the inside of the sampling tube measures the static pressure inside of the sampling tube. These two static tubes are carried outside of the gas main and connected to a monometer as shown in the sketch. Therefore, if the levels in the two legs of the monometer tube are kept in balance, the velocity in the sampling tube and the velocity in the gas main itself are maintained equal, which is absolutely necessary if the sample taken is to be representative.

The sampling tube itself is connected to a train of wash bottles and from this to a small 1/10 cu. ft. gas meter and thence to an aspirator. By the manipulation of the aspirator, the velocity in the sampling tube could be carried in direct variation of the velocity in the gas main itself, thus insuring that a true sample was being obtained. The manipulation of the aspirator was governed by watching the monometer. The sampling tube is made long enough to run a traverse from one side of the 5-ft. main to the other, so that a section of gas could be taken out at any point in the line and by moving back and forth during the test, a fair average sample was taken.

The discharge of the dust removed by the gas-cleaning equipment into an open or closed car proved objectionable. A dust-handling system has been devised and is now being installed for handling the dust from the dust catcher, whirlies and dry gas cleaner. This method consists of a specially designed chain running around special sprockets on which are mounted drag discs. Both lines of this conveyor are housed separately in U-shaped cast-iron troughs with removable wearing plates and covered over the tops with light plates for inspection and explosion protection.

The discharge from these two conveyors goes to a covered bin, which is vented. From this it is loaded by a special enclosed bucket elevator into an enclosed standard car. The conveyor flights under the dry gas cleaner are in a horizontal plane and rests on lower chords of the trusses, while the conveyor flights under the dust catcher and whirlies are in the vertical plane and the discharge from both cleaner units are so arranged that the dust may be discharged separately from the conveyor by operation of valves. During the passage through the bin the dust is slightly moistened by the addition of a small amount of water.

Thus far the operation of the cleaner would indicate a very low maintenance cost, and the item of labor is reduced to a minimum, inasmuch as one man per shift can easily handle the entire operation of a cleaner cleaning the gas from two 500-ton blast furnaces.

Manufacture of Grinding Balls at Denver

The rapid increase in the use of ball and tube mills during recent years for the crushing of ore, cement, paint pigments and other materials has created a new and growing subsidiary industry. An important item is represented by the iron or steel balls used for grinding and made by different methods and of different grades and kinds of iron and steel. These vary in size up to 10 in. in diameter. The annual consumption for the whole country runs into several hundred thousands of tons. Exact data for the whole country is not available, but a measure of the magnitude of this business can be had from some compilations made in connection with the Western field. It is reliably estimated that the consumption of balls west of the Mississippi River is in the neighborhood of 100,000 tons yearly and that the consumption of roll shells, steel dies and other wearing parts for the grinding equipment is about 50,000 tons more.

Practically all of this material comes from Eastern plants, as only three small plants west of the Mississippi River are equipped to meet this new and special demand. Recently a small operation engaged in the forging of balls of special alloys of chrome and manganese has been conducted at Denver, supplying in part the requirements of the large mining companies in Montana, Utah and Arizona. The heavy freight rates from the far Eastern points have given this new local industry a chance and the recent increase in all freight rates has been an additional incentive to the continuance and enlargement of the business.

Plans are now under way for the building of an electric furnace plant at Denver to engage principally in the manufacture of steel alloy balls for the Western demand. A basic electric furnace equipment is planned with a capacity of 20 tons of alloy steel from scrap in 24 hr. using 3-ton furnaces and electric power for reheating before forging. Investigation shows that electric reheating will be cheaper than oil at the present prices for oil and that with electric reheating there will be less loss by surface oxidation.

It is proposed to make high grade alloy steel balls, as recent tests have shown the ultimate economy of these for most uses if they can be obtained at a reasonable cost and at a lessened freight cost from point of production for the Western consumers. The steel base will be scrap from the local manufacturing concerns and from the extensive railroad shops at Denver and tributary to it in preference to the distant Eastern markets for scrap.

The proposed plant will be at Denver or at Utah Junction near Denver, where there are advantageous power conditions. N. C. Bonnevie, a metallurgical engineer of Denver, is the prime mover in the new enterprise which will have local financial backing for the initial installation.

The annual convention of sales representatives of the Youngstown Sheet & Tube Co. was held Dec. 30 and 31 at the home offices in Youngstown, Ohio. There were 50 in attendance from the district offices at Boston, New York, Philadelphia, Atlanta, Pittsburgh, Cleveland, Detroit, Chicago, St. Louis, Denver, Dallas, San Francisco and Seattle, as well as representatives from the Consolidated Steel Corporation, New York, export agent for the company. Dec. 30 was occupied by a trip through the main plant at East Youngstown, with dinner at the works office. In the evening the salesmen were entertained at the Youngstown Country Club. On Dec. 31 a general conference was conducted, presided over by W. E. Manning, general sales manager. Diverse views were expressed as to the business outlook, the most favorable opinions being voiced by Western and Southern representatives.

The Brass Industry in Great Britain

Output About Half That of the United States—Brass Foundry Practice and Labor Conditions—The Extrusion Process Largely a War Development

BY PAUL M. TYLER *

THE manufacture and utilization of brass comprise an important group of industries in the British Isles. According to the most recent census (1907) the output of brass and copper manufactures in the United Kingdom was valued at nearly £15,000,000 and over 20,000 persons were employed in the industry. For comparison with American statistics, the output of finished brass goods, amounting to £7,000,000 and employing 2000 workers should be added to the above figures. The data indicate that the volume of the British trade in that year was slightly more than one-half that of the United States.

While it is commonly recognized that the brass industry in both countries has expanded greatly since 1907 and especially since the outbreak of the war comparative figures covering the entire industry are not available. The writer's investigations, however, have covered several of the more important branches of the British brass industry and these will be discussed separately.

In dealing with the brass trade after the war, the Ministry of Reconstruction (British) adopted the following boundaries:

1. Raw material.
2. Rolling and drawing.
3. Brass founding and casting.
4. Engineering (chiefly machined products).
5. Lamps (including most of the pressed metal manufactures and especially carriage, automobile, motor cycle and ship's lamps).
6. Wrought and soldered work.
7. Naval screws, rivets, etc.
8. Locks and latches.
9. Bedsteads and all other subsidiary trades.

For the purposes of this discussion the industry can be most conveniently divided into three main branches, viz.:

(a) Cast products.
(b) Rolling mill and extruded shapes.
(c) Other products.

Since the conditions of raw material supply for each of these industries is slightly different, this factor does not require separate discussion. It may be mentioned, however, that both copper and zinc must be imported into the United Kingdom and that London prices for these metals since the war have averaged a little higher than New York quotations. The British copper supply, of course, comes chiefly from the United States and must sell at a trifle higher price, while an increasing supply of spelter in late months has been again derived from European sources with the prospect that as soon as the Belgian smelteries regain their pre-war capacity, zinc prices in London may be a little lower than American prices for this metal. The British zinc smelting industry has practically proved its inability to compete with external sources of supply. European stocks of scrap brass have diminished somewhat during the past year and are now held chiefly by consumers and middlemen, but they still form a fairly important feature of the present situation.

Brass Casting

The manufacture of brass castings in the United Kingdom is concentrated chiefly in the Birmingham area. There are some foundries in other sections and there is a sufficient development of the industry in Scotland and Ireland to warrant the existence of employers' associations among the brass founders in Glasgow and Belfast. There is also the Northern Employers' Brass Foundry Association with headquarters in Rotherham near Sheffield. These associations, however, are all affiliated with the Brass Foundry Employers' Association in Birmingham, which has some 180 members, comprising all of the larger firms and furnishing the bulk of the output of brass castings. The industry lends itself to the development of an enormous number of small establishments employing only one or two men and engaged in making light castings of various sorts (such as builders' hardware, hinges and knobs). The products of these small establishments consist wholly of specialties most of which are consumed more or less locally. Very few of these small firms are members of the association, but since their total output is relatively small it may be said that practically the whole British production of brass foundry products comes from associated establishments. There are a few fairly large firms, the largest operating five plants and employing a total of about 3000 hands, but the British brass foundry business is characterized by the large number of establishments of medium size.

Increasing Standardization

Specialization in manufacture has made some progress, especially since 1914, but British foundries generally make too wide a range of products for the most efficient utilization of their plants. This is due in part to the inherent inclination of the British manufacturer to cater to as great a variety of buyers as possible rather than to be solely dependent upon a fewer number of large consumers. Perhaps of equal significance is the practice of engineers in the British Isles to make individual specifications in their orders which necessitates the manufacture of supplies to individual order rather than in bulk. The latter difficulty has now in large part been done away with as far as hydraulic fittings are concerned, since the general adoption of the I. J. C. W. R. (Imperial Joint Committee of Water Works Regulations) standard. Most of the hydraulic fittings are brass, while most of the steam fittings, especially for high pressure service, are made from gun metal, the Admiralty specifications for which are 88 per cent copper, 10 per cent tin and 2 per cent zinc, although steam fittings for other consumers are more generally made from a cheaper mixture containing less tin and more zinc, since the Admiralty metal is costly to work. Machinists demand from 25 to 30 per cent increase over their usual piece rates when machining valves of this bronze. Steam fittings have always been more nearly standardized, however, than water fittings.

As regards miscellaneous castings, the activities of the association have resulted in a marked reduction in the number of designs produced by individual firms. The associated firms have come together and eliminated many competing lines by means of agreements and have attained a better specialization in output. Unnecessary patterns and designs for which the demand is comparatively small have been discontinued. One firm, for example, which formerly listed 22,000 different patterns in its catalog reduced the number in 1919 by 75 per cent.

Raw Material

British foundries almost without exception buy their brass in the form of ingots which are prepared by separate firms. These ingots are made chiefly from scrap and except for special work little attention is paid to the analysis, the brass founder generally working by rule of thumb. The ingot makers have a large variety of scrap to draw upon and are able to supply ingots at

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low cost. While the material varies somewhat in composition, it is deemed satisfactory for all classes of ordinary work. The prices vary according to the contracts made between the ingot makers and the founders but are always lower than the published quotations for brass, which are based upon ingots made from virgin metal. In January, 1920, for example, the average prices of remelted ingots ranged between £65 and £70 per ton, according to quality, whereas new brass was quoted at over £100.

Melting

Throughout the Birmingham area pit furnaces are used almost exclusively. For ordinary foundry work plumbago crucibles holding about 60 lb. of metal are employed. Gas firing has been tried at several foundries but has been found more costly than coke, which is now used in all the foundries. Since pouring is done only at the end of the day, there is no reason for hastening the melting with the consequent risk of cracking the crucibles. Birmingham gas coke is high in ash and sulphur, but since it costs only 30 to 35s. per ton, delivered at the works, as compared with over 60s. for metallurgical coke, it is more economical. The present price is approximately double the price before the outbreak of the war and this local coke has sold at less than 15s. per ton.

Data as to actual fuel consumptions are difficult to correlate on account of the variable size of the plants. Birmingham foundrymen who have traveled in the United States state, however, that their coke consumptions average higher than those in this country owing to the low heating value of their coke and the small melting units. On account of the slow heating, the life of the crucibles is fairly long, a crucible lasting almost invariably for more than 20 heats, and frequently as many as 40 heats are obtained from one pot.

Labor

Melters are paid by weight, generally on a sliding scale. The average earnings may be taken at a trifle more than £5 per week of 47 hours. During the war period, on heavy work, some melters earned as much as £15 per week under the same scale which is adapted to the ordinary light and medium castings for peaceful uses. Molders and finishers are paid either on piece rates or by the week. Piece rates generally are not popular with the workers, although they are figured on the basis of 25 per cent greater earnings for an average week's work.

Brass molders are not affiliated with the iron molders and were not involved in the protracted strike of the latter in the fall and winter of 1919-20. The Brass Workers and Metal Mechanics Association comprises practically all the workers in and about the brass foundries and deals with the employers' association in matters which affect both interests. There is no Whitley council for the trade, although the present arrangement operates quite similarly. All disputes are settled by means of conferences and there have been no strikes or lockouts.

Wages of Brass Molders

On and after Jan. 27, 1920, the following wage scale was in effect:

Day Work.	Per week of 47 hours.	
Dressers.	s. d.	Dollars.*
C Grade	75 11	$15.19
D Grade	83 10	16.17
E Grade	89 6	17.90
Polishers:		
D Grade	86 2	17.23
E Grade	91 9	18.35
Casters:		
Principal hand	98 5	19.69
Molder	85 10	17.18
Getter-down	77 1	15.42

* Exchange at £1 = $4.

The above wages are based upon a base rate plus various bonuses and awards amounting to a flat increase of 33s. 6d. per per week and an additional 12½ per cent on the total weekly earnings including both the base rate and bonuses. While piece rates are figured so as to permit a workman of average ability to earn 25 per cent more than on day work, the flat awards constitute so large a fraction of the total weekly earnings that many of the lower paid workers can earn only about 10 per cent more. The lowest grade of dressers (C grade), for example, who do simple threading and rough finishing, receive a base wage of only 34s. per week on day work, whereas their total weekly earnings are practically 76s. On piece work they are expected to earn 42s. 6d. instead of 34s. as a base wage (at the average rate of 25 per cent more than time wages), but the total weekly earnings after adding the same bonuses given to time workers would be 85s. 6d., or only about 12½ per cent more than the time workers.

Piece Work Rates

Casters on piece work receive the following base prices, inclusive of a pre-war bonus of 20 per cent:

Weight per mold.	Per Cwt. s. d.	Per Cwt. Dollars.*
From 6 to 7 lb.	17 0	$3.40
Over 7 to 8½ lb.	15 9	3.15
Over 8½ to 9½ lb.	14 0	2.80
Over 9½ to 10½ lb.	13 6	2.70
Over 10½ to 12 lb.	12 6	2.50

* Exchange at £ = $4.

The above rates are subject to war awards of 10 per cent plus a flat increase of 28s. 6d. per week. Special rates are paid for white metal cock work, etc., amounting to 2s. or more per cwt. above the rates for brass. Odd molds are paid for under the above rates plus 4d. per mold.

On fine and false cored castings for cabinet, chandelier, and electric work, the day work wages of the molders are the same as for ordinary work, although the principal hand receives 6s. more per week. For such piece work the regular base scale (not including the flat weekly awards) is as follows:

Weight per mold.	Per Cwt. s. d.	Per Cwt. Dollars.*
From 1½ to 2 lb.	73 6	$15.60
Over 2 to 2½ lb.	54 0	10.80
Over 2½ to 3 lb.	45 0	9.00
Over 3 to 4 lb.	38 0	7.60
Over 4 lb.	32 0	6.40

* Exchange at £ = $4.

Pin pattern work is paid for at 7d. per lb. or per piece by mutual agreement and extras are paid for all fine and false cored work. Green work is paid for at 31s. per cwt. for molds of 7 lb. or less, the scale dropping to 21s. for molds of 8½ lb. or more.

Common cabinet work is paid for at 22s. per cwt. up to a weight of 4¼ lb. per mold, scaling down to 14s. for molds of 5¼ lb. or over.

Aluminum castings are paid for at three times the prices for brass, and special rates are paid on a variety of individual products, although the variations in most cases are comparatively small. For example, pulley bowls, shoes and plates, etc., are paid for at 17s. per cwt.

The base rates for melting are 1s. 6d. per cwt. from the usual 60-lb. pot up to 120-lb. When 120-lb. or larger pots are used, as in rolling mills, the rate is 1s. 3d.

Die castings has come in very slowly and plate molding is not at all common in the United Kingdom. Due to increasing wages, however, there has been a strong tendency toward the elimination of foundry work on such articles as may be formed from rolled or extruded sections by means of machine tools. Prior to the war the various parts of an ordinary valve or faucet were almost wholly cast, whereas now in most foundries only the body is cast, the spindle being made from a rod, the wheel being stamped from a flat plate and the packing nut (gland) being either turned out from a solid rod or formed from sheet metal.

More Unskilled Workers

This revolution in practice has brought a great number of relatively unskilled workers, many of them women, into the brass foundries. Most of the semi-automatic machines are operated by women and girls whose wages on time work are between 30s. and 40s. per standard week of 47 hours including the flat war bonus of 16s. per week. As in the case of male workers, piece workers receive about 25 per cent more on their base earnings than time workers, but their total earnings are only about 15 per cent more. The average wages of women can be taken at less than 40s. ($8) per week with few getting as much as 50s. ($10).

The present wages of brass foundry employees in Great Britain are approximately 110 per cent higher

than they were in 1913. Prior to the war it was estimated that British wages in this industry were only about one-half those paid in the United States. If we assume that American wages have increased on an average by about 150 per cent, the British wage advances have been considerably less than those that have occurred during the same period in the United States, and the British foundries are now paying only about 40 per cent of the wages recently paid in the Connecticut foundries. At the same time the introduction of machine tools and improved methods of working has greatly increased the efficiency of the British plants.

Rolled and Extruded Shapes

The manufacture of rolled brass in the United Kingdom is also concentrated in the Birmingham area and most of the extruded shapes are made in that vicinity. Hot rolled brass and copper sheets, however, are made chiefly in South Wales in plants connected with the copper smelteries. Cartridge strip was made in large quantities in the British Government plant at Woolwich and during the last 12 months of the war at the new plant (since dismantled) at Southampton.

Most of the rod now used in England is extruded, the chief consumption being for capstan work. Extruded rods, however, are not used for making wire, since the British wire drawers specify rolled rods and frequently make them in the same establishment. The extrusion process in England is almost wholly a war development and the output increased by fully ten times during the war period. Due to accumulation of stocks, the trade has been very slack since the signing of the armistice and while a few plants have remained in operation it is doubtful if many of them have more than paid expenses. Since most of the machinery is of American manufacture and much of it was installed by American engineers, the British industry presents no features worthy of comment. The trade is not organized and little export business is done, although the two firms which dominate the industry are conducting a fairly ambitious campaign of education to introduce their products at home and in Colonial and South American markets.

Sheets, Rods and Strip

Yellow metal is largely made up in sheets, and is invariably hot-rolled. As stated, this industry has developed more in South Wales than in the Birmingham district and is closely allied to the copper smelting business. The distinction between the composition of "yellow metal" and "brass" is not clearly defined, but in England yellow metal is understood to mean a brass containing approximately 60 per cent copper and 40 per cent zinc (Muntz metal). It is rarely, if ever, sold on specification as regards impurities, whereas the rolled brass trade is accustomed to rigid specifications covering the allowable limits of lead and iron, as well as the content of copper and zinc. Whereas the metal used for brass foundry work will ordinarily contain in the neighborhood of 57 per cent copper, with varying amounts of impurities, rolled brass will generally contain 61 per cent of copper, sometimes more. Cartridge brass is a special alloy containing 70 per cent copper and 30 per cent zinc.

There are about 43 manufacturers of cold rolled rod and strip in the United Kingdom.* Strip is the more important product and is made in all widths from 2 in. to 18 in. and more. Even the widest material is called "strip," provided it is long enough to be rolled on reels as it comes off the rolls.

Increasing Cold Rolling Capacity

The pre-war output of cold rolled brass in England was between 15,000 and 16,000 tons annually. During the war production reached 60,000 tons, due partly to increased equipment and partly to the fact that many of the plants added a night shift. These figures do not include the brass actually used in the same plants (in which it is rolled) for the manufacture of wire and tubes. Taking these quantities into account, the productive capacity of British mills has been multiplied by six. The commercial turnover, however, in the early half of 1920 was not much more than double the pre-war tonnage, while the capacity as represented by net surplus which could be sold in semi-finished form (i. e. rod or strip) is not more than treble the pre-war output. Due to the difficulty of getting supplies and new machinery to replace that which had been worn out during the war, the British rolling mills were unable to meet the requirements of their customers until within the past four or five months. They are now able practically to meet the demands of their pre-war markets and expect within a year to have a surplus of some 300 tons a month which will be available for new customers. When plant renewals now under way are completed this amount may be increased by from 500 to 600 tons a week.

Variety of Product

Compared with American plants British brass rolling mills are small. The diverse character of the requirements of their customers has prevented the application of quantity production methods. For example, there is practically no standardization of the widths of strips. One tube maker may specify 2½-in. strip, another 2 3/16-in. and another will order 2¼-in. strip, although all three may be making 2-in. lapped tube. Similar variations are found as regards thickness of the brass. An effort is being made through the Cold Rolled Brass and Copper Association, which comprises most of the manufacturers, to bring about a better standardization of specifications. A little progress has been made, but there is slight chance of the British establishments being put upon the production of bulk lines to the extent that American mills now operate, since the British manufacturers believe that their chief advantage in outside markets is their ability to adjust their plants to the production of specialties.

Most of the equipment in British rolling mills is of home manufacture, although some German rolls which were installed before the war are still in operation. A considerable amount of antiquated equipment will still be found, but as soon as the present shortage is met and prices drop to a more normal level, most of these old plants will have either replaced their old machinery with up-to-date equipment or gone out of business.

Melting

The foundry practice in connection with the rolling mills is not greatly different from that in plants devoted to making brass castings. Melting is done in pit furnaces, using coke, but the crucibles are larger, holding from 120 to 200 lb. of metal. Greater care is taken in the selection of raw material and practically the only scrap used is that made in the same plant. Very little brass is bought and this is selected scrap or ingot, which sells at nearly the price of the constituent metals. Fully 60 per cent of the brass used in British rolling mills is made direct from virgin metals.

Labor

In spite of the large increase granted during and since the war, British wages are much lower than those paid in American brass rolling mills. The minimum wage for time workers who have had no previous experience in the trade and know nothing of the work is 63s. 7d. per 48-hour week. After a few weeks experience, such workers generally receive an increase so as to bring their earnings to more than 70 shillings, but outside the foremen, there are few workers that receive much above £4 (say, $16) per week. Complete schedules of wages have not been agreed upon as in the foundry trade, but wages are on practically the same levels. Piece work, except in melting, where the furnacemen are paid 1s. 3d. per cwt., is not common.

Living Conditions Good

Whereas the wages of British rolling mill operatives are slightly less than one-half those paid in Connecticut, the workers in Birmingham maintain practically the same standard of living as those in the United States on account of the much lower rent and cheaper cloth-

*Altogether there are 70 establishments in which nonferrous rolled products, including nickel, silver, aluminum, etc., as well as copper and brass are made.

ing. Their families are comfortably housed and well provided for. This was not always true, however. Prior to 1912 industrial conditions were distinctly bad and were only just beginning to improve when the war broke out. The common labor which now gets 63s. per week received only 18s. in 1912 and this amount was not sufficient to maintain a family. The wages were kept low because of the influx of agricultural labor which could be attracted from the farms at anything over about 16s. a week. The union now insists that the rolling mill operators are skilled workers, and while much of the work can be done by inexperienced men the employers have accepted the designation and have practically agreed not to replace experienced men with men from other trades. The changes have been brought about with little friction and conferences are arranged between employers' and workers' associations similar to the Whitley plan and to those in the foundry trade.

Costs and Prices

British manufacturers assert that, in spite of their apparently overwhelming advantage as regards wages, their costs of production are undoubtedly as high as those in American mills. They claim that the small size of their plants results in much lower output per operative, so that their actual manufacturing costs are not greatly different from those in the United States and that since the war their raw material costs them more. A statement prepared jointly by a group of manufacturers and covering operations in December, 1919, indicates an average sales price of 1s. 3¼d. per lb. on brass strip. This is equivalent to £138 15s. 6d. per ton after deducting the 2½ per cent discount which was allowed on all these sales. During the same month, the average metal price as taken from the books was £98 6s. Since the average loss of metal was 3 per cent, the metal cost per ton of product was £101 4s. 7d., or less than 73 per cent of the sales price.

The above figures are stated to be fairly representative of the normal ratio of prices to raw material cost in British works. It is stated that only rarely is the differential on strip over about 30 per cent above the cost of the raw material and this 30 per cent must cover fuel, labor, power, etc., together with the profits on the business.

Organization

Of the 43 manufacturers of cold rolled brass in the United Kingdom, 40 are members of the association. Nearly all of these melt up their own brass in foundries connected with their works and all of them make more than one product. More than half of them make tubes as well as strip and rod and most of the others make wire. There are several tube manufacturers that specialize on those articles and buy all of their strip from outside establishments. Several of the independent tube makers, most of whom are located in Leeds and South Lancashire, belong to a separate association and are not members of the Cold Rolled Brass and Copper Association. The wire manufacturers have a separate association, but the Brass Wire Association is closely allied to the Rolled Brass Association and many of its members are also affiliated with the latter.

Brass Wire

Wire drawing is done by several firms in the rod rolling business but is also carried on in separate establishments. The total output is less than one-fourth the tonnage of the brass rolling mills and can be taken at approximately 10,000 tons annually, this figure covering all classes of non-ferrous metal wire, including brass, copper, phosphor-bronze, nickel-silver wire, etc. There are 25 members of the Brass Wire Association and these firms furnish over 90 per cent of the total output. Few of these firms make manufactures of wire and most of them draw down to a minimum of No. 25 gage. Finer sizes, such as those used for wire cloth, are made in the consumer's plant.

Generally speaking, the equipment of British brass wire works is antiquated and inefficient. Continuous wire drawing to the extent of six blocks in series is conducted at some establishments but is not general. Prices and costs are practically as high as in the United States, while the output is not greatly in excess of home requirements although a limited export business is done, chiefly with British possessions. Wire goods are made in England in considerable quantity and sell cheaply in foreign markets, but the advantage of the British manufactures of these more highly finished articles seems to be rather in the drawing of fine sizes and weaving, etc., than in obtaining cheap wire of the coarser gages.

Other Manufactures

A wide variety of specialties of all kinds are manufactured in various localities in the United Kingdom, but by far the greater part of these are manufactured in the Birmingham district. Most of the plants are comparatively small and the employers are not organized, but the male workers are affiliated with the union of the engineering trades. In general, the developments during and since the war have not been important. As in other branches of the brass trade, there has been no lack of orders and all the establishments have been kept occupied to full capacity. The increased demand for electrical appliances and the growth of the automobile industry accounts in part for the greater activity. A great many pressed metal articles formerly imported from Germany are now being made in England, but the only important new line is the manufacture of bronze powders which are now being produced in fair quantity for home consumption and export, whereas prior to the war none was made in the United Kingdom.

A large part of this work is done by women who receive from 40s. to 60s. per week of 47 hours. Skilled male labor earns up to about 90s. as a maximum, averaging about 80s.

Comparison of British and German Brass Works

A delegation of British brass manufacturers visited a number of plants in the occupied area of Germany in the summer of 1919. The delegates undertook their mission with the feeling that the German manufacturer was well ahead of them in manufacturing methods, but they reported on their return that the one advantage the Germans had was due to the smaller variety of articles produced by each manufacturer which enabled a greater concentration of output and a larger turnover, combined with that careful attention to the manufacture which is characteristic of the German.

The German casting methods presented the greatest divergence from British practice. One practice generally observed in German works but rarely employed in England was to put the molds in an oven as soon as they are made and dry them there for 24 hours. The molds when cored up are placed on top of each other forming a pile 3 ft. or 4 ft. high. They are bolted together and then laid on end for pouring in the usual way. It was found common practice in the German works for the castings to be cut off the ridges when cold by means of a sprue-cutting machine. In one works where hand molding was in progress the sand was compressed in the molds by means of a metal ball about 7 in. in diameter and weighing some 50 lb. It seems that such practice might insure a more regular pressure for work that does not vary too much in height.

The German melting furnaces were apparently more in conformity with American practice, although both pit furnaces and tilting furnaces were observed. It was remarked with some surprise by the British visitors that in certain plants pots were used only as ladles to carry the molten metal from the furnace to the molds. Both oil and coke fired furnaces were in use.

The British visitors were convinced that greater attention was paid in the German plants to the production of sheet brass than in their own country. The utmost care was noted in removing by chemical and mechanical means all oxides and foreign matter from the surface of the metal before it entered the rolls, with the result that a much better and finer product was secured. It also seemed that the slitting of the sheet brass was done very much better than in England, greater accuracy and cleaner cut edges being obtained, which results in a minimum of waste in working up.

Modern Automobile Spring Manufacturing

Detroit Steel Products Co. Also Makes Fenestra Steel Window Sash—New Design Furnaces Use City Gas for Fuel—Spring Forming Machines

BY DON F. KENNEDY*

RECENT completion of a new addition to the plant of the Detroit Steel Products Co. puts this company in possession of what is considered one of the most up-to-date automobile spring plants in the country. Specially designed equipment, largely the product of this company's tool design department, and use of the progressive assembly principle, has resulted in many features of interest and in unusual production figures.

This company also manufactures the well known Fenestra steel factory window sash. Numerous points of interest are also involved in this little known class of manufacture, which consists of punching, machining and assembling a large variety of special rolled steel shapes.

The new addition consists of two bays adjoining the older spring shop, one bay measuring 65 x 335 ft. used for steel storage, and one 38 ft. 8 in. x 311 ft. used for the manufacture of springs. The entire plant covers approximately 400,000 sq. ft. of floor space, divided about equally between spring and steel sash production. About 1400 employees constitute the normal working force. Production figures per man per square foot of floor space have been greatly increased during the past two years.

Specially designed machinery has been made almost entirely in the company's own tool room and machine shop. The success of the tool design department together with satisfactory application of piece work rates to the entire plant has been chiefly responsible for the production showing made. Four men are continually employed in designing special machinery and tools.

Negro help has been used to a considerable extent during the past two years, but is being reduced. A large number of negroes were imported to Detroit from the South during the war and following it. They were attracted by the high wages paid here, but it has been found that they had no idea of working any more than necessary. During the greatest scarcity of labor it was found that they would not listen to requests for a fair day's work, and in such work as unloading cars of steel by hand a man would carry one bar at a time only instead of three or four, which would be only a normal load, and that they would stand inside the cars more than they worked. It is estimated here that negro labor will do only about a third as much as common white labor.

At one time about 100 women were employed through the factory on light punch press work, assembling, hand tapping and similar operations. The same piece work rates were paid as for men, rates being set so as to allow $5 to $6 for nine hours. No great difference was found one way or the other from male help. Those who have wished to stay have been retained but no new women employees have been taken on. At present there are about 25 women who have remained.

> The labor situation in Detroit for the past few years has been as difficult as in any part of the country, yet this firm has never had a strike or a strike threat to contend with. In two years, with equal floor space, 10 per cent more machinery and 25 per cent more men, production has been tripled. Spring production in 1919 was double that of 1918 with the same floor space. In spite of interruptions during the early part of this year by coal strikes and railroad strikes, production figures are eight times that of 1918, with only 50 per cent greater floor space.

Spring Manufacture

Proceeding first with the process of spring making, steel is unloaded by Pawling & Harnischfeger cranes into the steel storage bay. A car has been unloaded in 18 min. Five hundred tons a day can be handled here. In 10 hrs. the steel consumption in the spring department is 165 tons. An inspector from the metallurgical department watches all steel as it is unloaded for surface defects. A check analysis is made of every heat, which is marked and kept separate by the steel manufacturers, before the car is released for unloading. The principal steels used for springs are straight carbon, chrome - silico - manganese and chrome-vanadium.

The main leaf of each spring is stamped with the date of manufacture, and records are kept of the heat from which each set of springs is made. By consulting the pyrometer records for that date a complete record of any individual spring is obtainable, covering the maker of the steel, the analysis and the heat treatment, with the names of the foremen and inspectors who handled it.

The bars are laid by the cranes directly on the shear tables where they are cut up into individual lengths. Note is made of the varying lengths of bars and cuts are so adjusted as to eliminate waste ends. The total loss in the spring department from trimming and scale in forging and heat treatment runs between 3½ and 4 per cent.

Cut lengths are piled on steel hand trucks and move from machine to machine on these trucks during trimming, punching, rolling the ends and forming the eyes. Springs having center bolt holes are cold punched, while those having bosses or nibs to maintain the leaves in position are heated. These operations are performed on machines located close enough together to eliminate carrying the stock any distances on the trucks.

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*Sales engineer, Detroit.

ing. Their families are comfortably housed and well provided for. This was not always true, however. Prior to 1912 industrial conditions were distinctly bad and were only just beginning to improve when the war broke out. The common labor which now gets 63s. per week received only 18s. in 1912 and this amount was not sufficient to maintain a family. The wages were kept low because of the influx of agricultural labor which could be attracted from the farms at anything over about 16s. a week. The union now insists that the rolling mill operators are skilled workers, and while much of the work can be done by inexperienced men the employers have accepted the designation and have practically agreed not to replace experienced men with men from other trades. The changes have been brought about with little friction and conferences are arranged between employers' and workers' associations similar to the Whitley plan and to those in the foundry trade.

Costs and Prices

British manufacturers assert that, in spite of their apparently overwhelming advantage as regards wages, their costs of production are undoubtedly as high as those in American mills. They claim that the small size of their plants results in much lower output per operative, so that their actual manufacturing costs are not greatly different from those in the United States and that since the war their raw material costs them more. A statement prepared jointly by a group of manufacturers and covering operations in December, 1919, indicates an average sales price of 1s. 3¼d. per lb. on brass strip. This is equivalent to £138 15s. 6d. per ton after deducting the 2½ per cent discount which was allowed on all these sales. During the same month, the average metal price as taken from the books was £98 6s. Since the average loss of metal was 3 per cent, the metal cost per ton of product was £101 4s. 7d., or less than 73 per cent of the sales price.

The above figures are stated to be fairly representative of the normal ratio of prices to raw material cost in British works. It is stated that only rarely is the differential on strip over about 30 per cent above the cost of the raw material and this 30 per cent must cover fuel, labor, power, etc., together with the profits on the business.

Organization

Of the 43 manufacturers of cold rolled brass in the United Kingdom, 40 are members of the association. Nearly all of these melt up their own brass in foundries connected with their works and all of them make more than one product. More than half of them make tubes as well as strip and rod and most of the others make wire. There are several tube manufacturers that specialize on those articles and buy all of their strip from outside establishments. Several of the independent tube makers, most of whom are located in Leeds and South Lancashire, belong to a separate association and are not members of the Cold Rolled Brass and Copper Association. The wire manufacturers have a separate association, but the Brass Wire Association is closely allied to the Rolled Brass Association and many of its members are also affiliated with the latter.

Brass Wire

Wire drawing is done by several firms in the rod rolling business but is also carried on in separate establishments. The total output is less than one-fourth the tonnage of the brass rolling mills and can be taken at approximately 10,000 tons annually, this figure covering all classes of non-ferrous metal wire, including brass, copper, phosphor-bronze, nickel-silver wire, etc. There are 25 members of the Brass Wire Association and these firms furnish over 90 per cent of the total output. Few of these firms make manufactures of wire and most of them draw down to a minimum of No. 25 gage. Finer sizes, such as those used for wire cloth, are made in the consumer's plant.

Generally speaking, the equipment of British brass wire works is antiquated and inefficient. Continuous wire drawing to the extent of six blocks in series is conducted at some establishments but is not general. Prices and costs are practically as high as in the United States, while the output is not greatly in excess of home requirements although a limited export business is done, chiefly with British possessions. Wire goods are made in England in considerable quantity and sell cheaply in foreign markets, but the advantage of the British manufactures of these more highly finished articles seems to be rather in the drawing of fine sizes and weaving, etc., than in obtaining cheap wire of the coarser gages.

Other Manufactures

A wide variety of specialties of all kinds are manufactured in various localities in the United Kingdom, but by far the greater part of these are manufactured in the Birmingham district. Most of the plants are comparatively small and the employers are not organized, but the male workers are affiliated with the union of the engineering trades. In general, the developments during and since the war have not been important. As in other branches of the brass trade, there has been no lack of orders and all the establishments have been kept occupied to full capacity. The increased demand for electrical appliances and the growth of the automobile industry accounts in part for the greater activity. A great many pressed metal articles formerly imported from Germany are now being made in England, but the only important new line is the manufacture of bronze powders which are now being produced in fair quantity for home consumption and export, whereas prior to the war none was made in the United Kingdom.

A large part of this work is done by women who receive from 40s. to 60s. per week of 47 hours. Skilled male labor earns up to about 90s. as a maximum, averaging about 80s.

Comparison of British and German Brass Works

A delegation of British brass manufacturers visited a number of plants in the occupied area of Germany in the summer of 1919. The delegates undertook their mission with the feeling that the German manufacturer was well ahead of them in manufacturing methods, but they reported on their return that the one advantage the Germans had was due to the smaller variety of articles produced by each manufacturer which enabled a greater concentration of output and a larger turnover, combined with that careful attention to the manufacture which is characteristic of the German.

The German casting methods presented the greatest divergence from British practice. One practice generally observed in German works but rarely employed in England was to put the molds in an oven as soon as they are made and dry them there for 24 hours. The molds when cored up are placed on top of each other forming a pile 3 ft. or 4 ft. high. They are bolted together and then laid on end for pouring in the usual way. It was found common practice in the German works for the castings to be cut off the ridges when cold by means of a sprue-cutting machine. In one works where hand molding was in progress the sand was compressed in the molds by means of a metal ball about 7 in. in diameter and weighing some 50 lb. It seems that such practice might insure a more regular pressure for work that does not vary too much in height.

The German melting furnaces were apparently more in conformity with American practice, although both pit furnaces and tilting furnaces were observed. It was remarked with some surprise by the British visitors that in certain plants pots were used only as ladles to carry the molten metal from the furnace to the molds. Both oil and coke fired furnaces were in use.

The British visitors were convinced that greater attention was paid in the German plants to the production of sheet brass than in their own country. The utmost care was noted in removing by chemical and mechanical means all oxides and foreign matter from the surface of the metal before it entered the rolls, with the result that a much better and finer product was secured. It also seemed that the slitting of the sheet brass was done very much better than in England, greater accuracy and cleaner cut edges being obtained, which results in a minimum of waste in working up.

Modern Automobile Spring Manufacturing

Detroit Steel Products Co. Also Makes Fenestra Steel Window Sash—New Design Furnaces Use City Gas for Fuel—Spring Forming Machines

BY DON F. KENNEDY*

RECENT completion of a new addition to the plant of the Detroit Steel Products Co. puts this company in possession of what is considered one of the most up-to-date automobile spring plants in the country. Specially designed equipment, largely the product of this company's tool design department, and use of the progressive assembly principle, has resulted in many features of interest and in unusual production figures.

This company also manufactures the well known Fenestra steel factory window sash. Numerous points of interest are also involved in this little known class of manufacture, which consists of punching, machining and assembling a large variety of special rolled steel shapes.

The new addition consists of two bays adjoining the older spring shop, one bay measuring 65 x 335 ft. used for steel storage, and one 38 ft. 8 in. x 311 ft. used for the manufacture of springs. The entire plant covers approximately 400,000 sq. ft. of floor space, divided about equally between spring and steel sash production. About 1400 employees constitute the normal working force. Production figures per man per square foot of floor space have been greatly increased during the past two years.

> The labor situation in Detroit for the past few years has been as difficult as in any part of the country, yet this firm has never had a strike or a strike threat to contend with. In two years, with equal floor space, 10 per cent more machinery and 25 per cent more men, production has been tripled. Spring production in 1919 was double that of 1918 with the same floor space. In spite of interruptions during the early part of this year by coal strikes and railroad strikes, production figures are eight times that of 1918, with only 50 per cent greater floor space.

Specially designed machinery has been made almost entirely in the company's own tool room and machine shop. The success of the tool design department together with satisfactory application of piece work rates to the entire plant has been chiefly responsible for the production showing made. Four men are continually employed in designing special machinery and tools.

Negro help has been used to a considerable extent during the past two years, but is being reduced. A large number of negroes were imported to Detroit from the South during the war and following it. They were attracted by the high wages paid here, but it has been found that they had no idea of working any more than necessary. During the greatest scarcity of labor it was found that they would not listen to requests for a fair day's work, and in such work as unloading cars of steel by hand a man would carry one bar at a time only instead of three or four, which would be only a normal load, and that they would stand inside the cars more than they worked. It is estimated here that negro labor will do only about a third as much as common white labor.

At one time about 100 women were employed through the factory on light punch press work, assembling, hand tapping and similar operations. The same piece work rates were paid as for men, rates being set so as to allow $5 to $6 for nine hours. No great difference was found one way or the other from male help. Those who have wished to stay have been retained but no new women employees have been taken on. At present there are about 25 women who have remained.

Spring Manufacture

Proceeding first with the process of spring making, steel is unloaded by Pawling & Harnischfeger cranes into the steel storage bay. A car has been unloaded in 18 min. Five hundred tons a day can be handled here. In 10 hrs. the steel consumption in the spring department is 165 tons. An inspector from the metallurgical department watches all steel as it is unloaded for surface defects. A check analysis is made of every heat, which is marked and kept separate by the steel manufacturers, before the car is released for unloading. The principal steels used for springs are straight carbon, chrome - silico - manganese and chrome-vanadium.

The main leaf of each spring is stamped with the date of manufacture, and records are kept of the heat from which each set of springs is made. By consulting the pyrometer records for that date a complete record of any individual spring is obtainable, covering the maker of the steel, the analysis and the heat treatment, with the names of the foremen and inspectors who handled it.

The bars are laid by the cranes directly on the shear tables where they are cut up into individual lengths. Note is made of the varying lengths of bars and cuts are so adjusted as to eliminate waste ends. The total loss in the spring department from trimming and scale in forging and heat treatment runs between 3½ and 4 per cent.

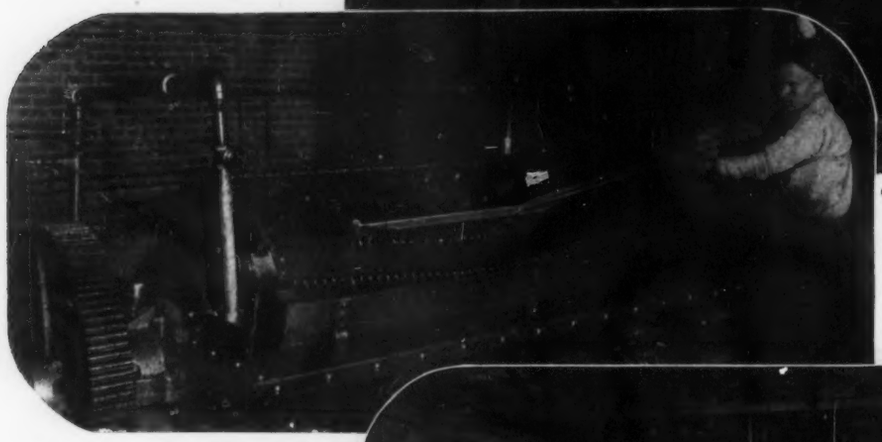
Cut lengths are piled on steel hand trucks and move from machine to machine on these trucks during trimming, punching, rolling the ends and forming the eyes. Springs having center bolt holes are cold punched, while those having bosses or nibs to maintain the leaves in position are heated. These operations are performed on machines located close enough together to eliminate carrying the stock any distances on the trucks.

The leaves are then ready for forming, or "pinching," as putting the curve in them is termed, and subsequent heat treatment and tempering. Some types are pinched in hand machines. The springs made in the hand forming department are heated and oil quenched from large rotary furnaces of the company's own design. The pinching machines have rows of fingers or stops which can be set so as to form any curve required. The different curves required for separate orders may be set up or changed very quickly. A sample spring for each new order is made by hand, and the machines are set up for the differing curve for each leaf from the

*Sales engineer, Detroit.

Spring Making Department of Detroit Steel Products Co.

Above Are McCann-Harrison Continuous Tempering Furnaces

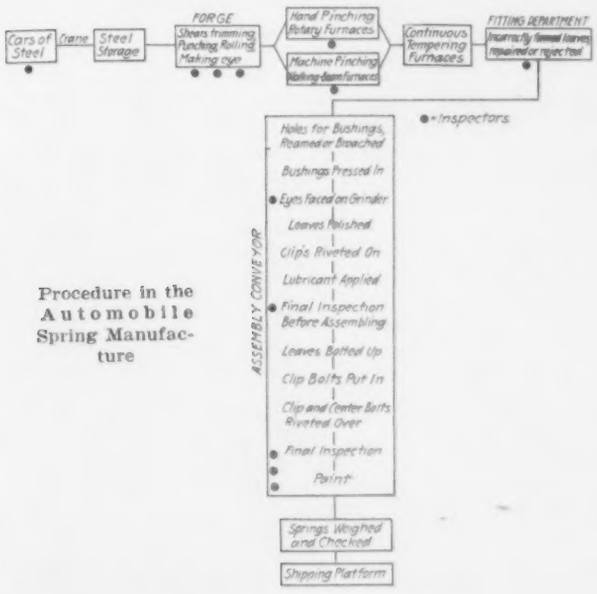


In the McCann-Harrison "Walking-Beam" Furnace Shown Above, the Beams Are in Raised Position, Carrying Contents of the Furnace Forward

The Power Spring Forming Machine with End of Heating Furnace Adjacent

Spring Assembly Conveyor with Tempering Furnaces in Background. At Left Is Spring Testing Machine

sample. Two new power pinching machines designed and built in the plant have just been put into operation. An accompanying illustration shows a heated leaf being removed from the furnace and put into the jaws. These jaws are set up from the sample spring at leisure and may be attached to the machine quickly. The jaws come together, forming the proper set for each leaf, and the head revolves toward the operator, quenching the leaf in oil. As the machine makes subsequent steps in the revolution as other leaves of the set are formed the jaw releases, letting the leaf drop in the oil on a moving conveyor, which brings it up to the surface at the back of the tank. From there the leaves go to the assembly conveyor. Oil is circulated through the plant by underground pipes, cooled in a water tower and placed back in circulation. Any number of sets of forming jaws may be set up independently, and changes can be made on the machine quickly.



Procedure in the Automobile Spring Manufacture

Two new McCann-Harrison walking-beam type furnaces for heating the spring leaves incorporate some unique features. These furnaces are of special design, worked out by the McCann-Harrison Co.'s engineers in conjunction with the Detroit Steel Products Co. The leaves are laid in sets on the hearth of the furnace as shown in the illustration. At regular intervals two beams running lengthwise the full length of the furnace are raised several inches by a cam action below the platform. The illustration shows the furnace in the raised position. The spring leaves are lifted clear of the floor of the furnace. The beams then move forward several inches and then lower, depositing the entire contents of the furnace on the floor again, one leaf-length ahead of the previous position. The pinching machine is thus fed continuously. The action of the furnace and of the pinching machine is interlocking so that if one is stopped the other stops likewise.

These furnaces and the new tempering furnaces are heated by city illuminating gas. The present price is 49c. per 1000 cu. ft. The rate is expected to advance shortly. It is figured that gas even at 80c. would be cheaper than oil at 10c. per gallon. It is easier to control than oil and the flame is less oxidizing. The more important furnaces throughout the plant are being changed from oil to gas fire as rapidly as practicable. Gas taken from the city mains is compressed to a uniform pressure of 12 lb. Special Surface Combustion induced air burners are used. These are specially designed and have automatic fuel and temperature controlling devices which make practical a furnace temperature uniform within 5 deg. without attention of the furnace operator. If the continuous operation of the furnace is stopped for any reason the control apparatus automatically cuts down the gas supply sufficiently to keep the desired temperature constant. Leeds & Northrup recording pyrometers are used. They are checked daily for accuracy, but adjustments are reported as seldom necessary.

After quenching, the spring leaves are put on the moving hearth of the continuous McCann-Harrison tempering furnaces shown. These furnaces as well as most of the machinery about the plant are individually motor driven. The tempering furnaces are fired in a similar manner to the ones described above. The length of the furnace and the speed with which it moves are adjusted so that the leaves have been thoroughly soaked at the proper temperature for drawing on their exit.

After leaving the tempering furnaces the springs come to the fitting department where the individual leaves are assembled into complete sets. Incorrectly formed leaves or leaves that have met with any irregularities up to this point are sorted out here and repaired or rejected. It is not now necessary to keep individual sets intact through the process up to this point. Until recently such procedure was necessary, and it was necessary to assemble and fit up by hand all sets of springs. The new processes of machine forming and treating together with improvements in hand forming have made spring leaves dependably interchangeable.

The spring sets then go to the assembly conveyor. This is 175 ft. in length. The first operation on the conveyor is to ream or broach the eyes of the main leaf, which operation is held within limits of 0.001 in. Bronze or steel bushings are then pressed in by a Hercules arbor press of special design. The rack type ram is operated by a friction clutch engaged by the operator's foot. The clutch automatically releases when the bushing is flush with the face of the spring. The eyes are next faced for width within 0.005 in. on a grinder having two parallel wheels which are pressed together by action of the operator's foot. The leaves are next polished when necessary to remove scale or burrs. The clips are riveted on, graphite grease is applied with a brush, and the spring is then given a careful inspection to eliminate future disassembling as far as possible. The leaves are then compressed by an air or hydraulic clamp, the center bolt is inserted, and an air-driven wrench tightens the nut. The clip bolts are here inserted, and the ends as well as the ends of the center bolt are riveted over.

Springs are carefully tested for height after a 200 per cent deflection given by an arbor press type testing machine. This test catches any soft leaves, which are shown by the spring not coming back to its proper height, and catches leaves that are too hard by breaking them. Springs are usually ordered to carry a certain load at a specified deflection, and it is left to the spring manufacturer to design the spring to meet these requirements.

The springs are then given a final inspection, and painted when this is specified. They are then weighed and checked, and are ready for shipment. Springs are sold by the pound. Those made here will range from 12½ to 300 lb. each. The flexibility of the conveyor assembly system is demonstrated by its ability to handle simultaneously as many as three different types of springs.

Inspection is carried out thoroughly. Inspectors are stationed at the steel unloading bay, at three

places in the forge, at the forming machines, fitting department, at two places on the conveyor and at the final inspection. This careful inspection, together with the record kept by which each spring can be checked back, results in a feeling of individual responsibility which has a powerful deterrent effect on the entire working force.

Fenestra Department

The steel sash industry has sprung up within the last ten or twelve years. This type of sash is now nearly universal in factory construction. Its manufacture in brief is a problem of piercing and assembling many different and unusual rolled steel sections. The sash is crated and shipped to the job, the glass being inserted after erection.

The automobile spring business is an outgrowth of the wagon spring business. Wagon springs have been made for many years and in numerous localities. Due to this condition, the industry as a whole has not developed as many improvements and modern methods as have been seen in other branches of the automobile industry, such as motors, gears, axles, electrical systems, etc., which have been built up from the ground with no traditions or customary practices to follow. It is only within the last two or three years that methods which are in keeping with other branches of the automobile industry have been worked out.

On the other hand, the steel sash industry had no mentors, nor had it any set customs or prejudices to follow. It was confronted with the problem of handling by machinery odd-shaped bars of steel, and it accordingly developed numerous individual methods of handling this problem. About 80 per cent of the steel used in manufacture of steel sash consists of special rolled sections. During scarcity of steel the question of supply is more difficult than in other industries which require standard sections. The largest sections are hot rolled at the steel mills, and the smaller ones are formed in the Detroit Steel Products Co.'s shop from strip steel. While certain sizes of sash are looked upon as standard sizes, 90 per cent of the orders are special, making it necessary to follow each order through individually.

The sections, after being rolled, are cut to length in various presses having specially designed dies to accommodate the peculiar sections handled, and to cut them off straight or mitred, as the case calls for. The cut lengths are loaded on hand steel trucks and moved from machine to machine thereon. Piercing of the patented Fenestra joint is shown in the illustration. Some five or six different operations at one setting of the press are required to make the joint. The bars are assembled by hand, one being interlocked into the others, and the joints and ends are hammered over by hand dies or by hammers only, or by pneumatic hammers. The assembled sash are trued up by blows of a hammer, and then hung on hooks and carried by overhead trolley to the paint vat, where they are dipped. Tags attached to each sash are marked with the job number by perforations which can be read through the paint. After drying, the sash is ready for crating and shipment.

The finished product, being so much more bulky than the raw material, makes the car supply problem a major one. An idea of the amount of work turned out can be realized when it is considered that 175 tons of these light steel sections are used per day. All work is done on a piece-work basis. This system has been in successful operation here since the beginning of the company.

During the past year an export business has been developed which is now taking about 10 per cent of the total production of the sash department. Export sash is sent mostly to Cuba, China and Japan. A branch factory at Toronto takes care of the Canadian trade.

The personnel of the company is as follows: John G. Rumney, president; Mason P. Rumney, vice-president and assistant general manager; Victor F. Dewey, vice-president and general manager; A. L. Baldwin, vice-president in charge of production; H. F. Wardwell, secretary and general sales manager; E. R. Ailes, treasurer; A. T. Hugg, advertising manager; C. R. Raquet, Fenestra sales manager; J. Gogan, general superintendent.

Another Metric System Bill

WASHINGTON, Jan. 4.—Although there is still no possibility of action at the present session of Congress, the propagandists of the metric system have succeeded in inducing a member of the House of Representatives to introduce their metric system bill in the lower House. Two weeks ago, Senator Frelinghuysen of New Jersey introduced a similar bill, "by request" in the Senate. The House bill has been introduced by Representative Fred A. Britten of Chicago. Although Senator Frelinghuysen frankly told the propagandists that he would do nothing during the session to push the measure, the Chicago congressman is quoted in the publicity matter given out by the press agent for the propaganda as "pressing for immediate consideration."

Inquiring congressmen are also being assured that the Department of Commerce and the Bureau of Standards have approved the Britten bill, although they have not made public that approval. The present campaign is in charge of a representative of the World Trade Club of San Francisco and New York, who apparently has made his headquarters in Washington and has already succeeded in getting considerable publicity for his measure by declaring that "eminent Americans have issued public statements favoring the metric cause."

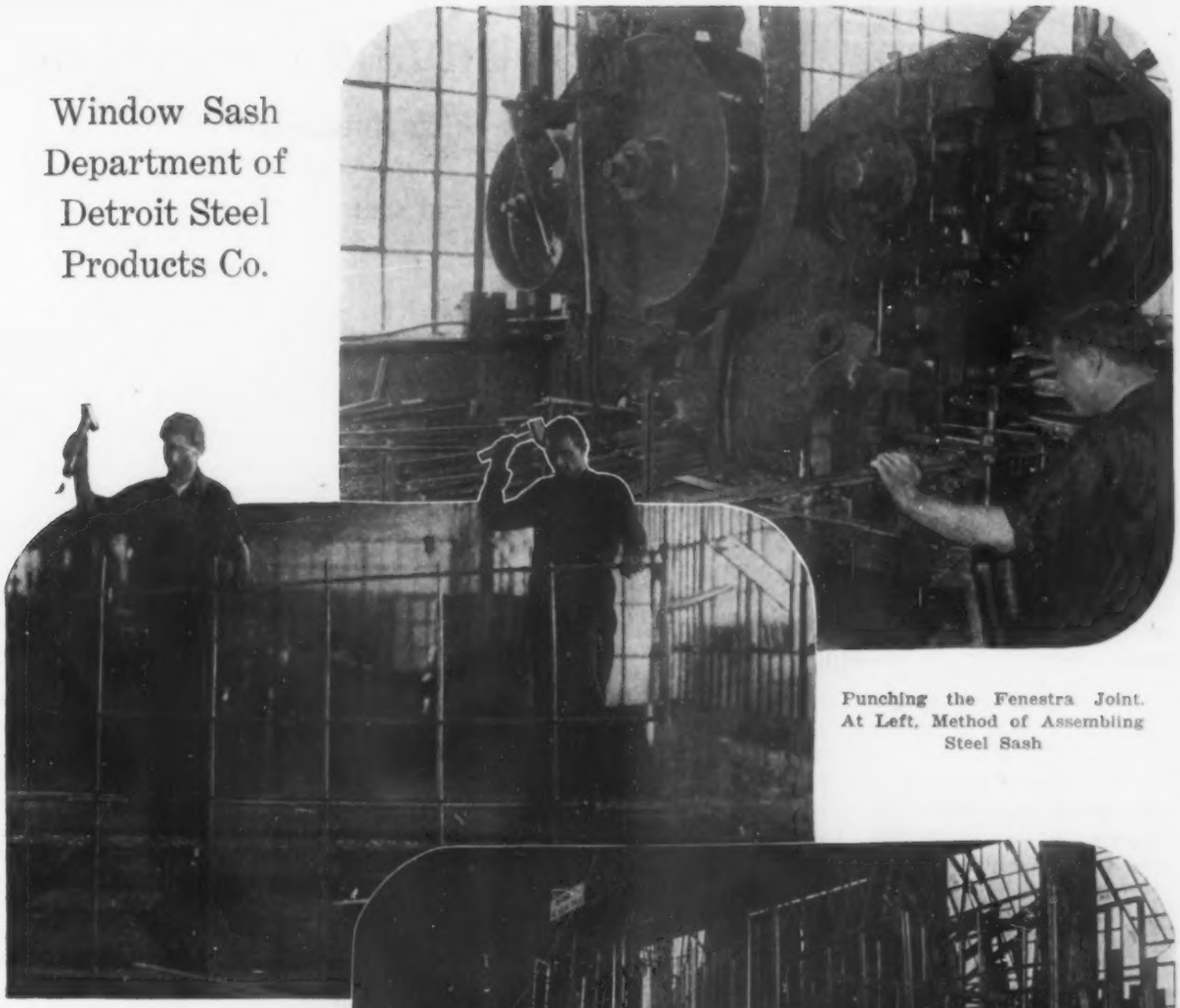
Congressman Britten has promised to reintroduce the bill on the first day of the Sixty-seventh Congress and to push the measure at that session, because the end of the Sixty-sixth Congress on March 4 will automatically cause the expiration of the present Frelinghuysen and Britten bills. He expects to have the Committee on Coinage, Weights and Measures of the next House hold hearings upon the bill.

French Duties Re-established

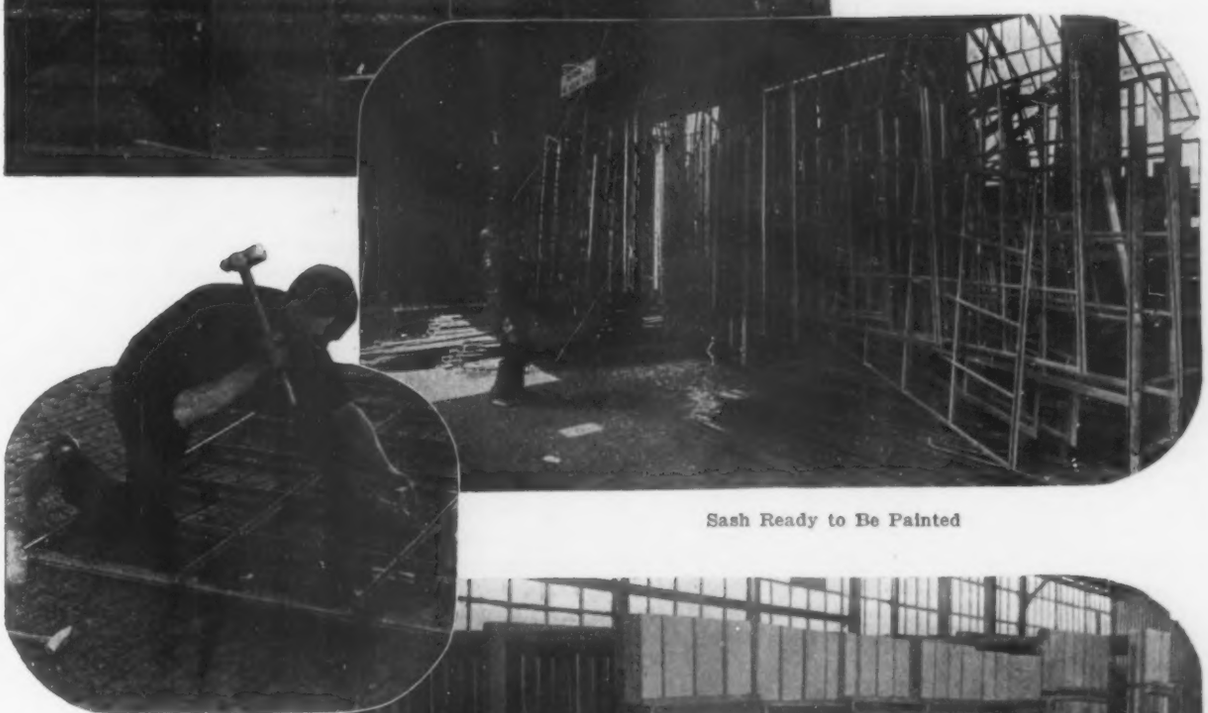
WASHINGTON, Jan. 4.—A cablegram from Commercial Attache W. C. Huntington, Paris, states that a French decree of Dec. 18, published in the Journal Officiel for Dec. 27, reestablishes with the corresponding coefficient, the import duty on rails, fishplates, bridges and parts thereof which was suspended by decree of Nov. 30, 1914, and March 3, 1915, in cases where such materials were required for repairs on railways, etc., necessary for national defense. The duty on heavy structural iron and steel is 12 francs per 100 kilos, with a coefficient of 3, which makes the duty now in force 36 francs per 100 kilos or $3.15 per 100 lb.

The S. W. Card Mfg. Co., Mansfield, Mass., taps and dies, is having an artesian well sunk on its property for the purpose of providing water of an even temperature to be used in connection with its hardening department. Other plants of this concern have used artesian well water with success for some time. The well at the Mansfield plant is down to a point where 80 gallons of water per minute are obtained, as against 40 gallons, the company's requirements. The content of the water, however, is not wholly satisfactory, but the engineers are confident the trouble will be overcome as the well is sunk deeper. Waste water from the brine cooling tanks will be utilized elsewhere in the plant. A pump house of ample capacity will be constructed this winter, and the new water system should be in working order before spring.

Window Sash Department of Detroit Steel Products Co.



Punching the Fenestra Joint. At Left, Method of Assembling Steel Sash



Sash Ready to Be Painted

Hammering Down Locking Wing

At Right—How the Solid Steel Windows Are Crated Ready for Shipment Abroad

The Importance of Continuing Production

Employers and Workers Alike Interested in Deflation—Lower Wages and Prices Preferable to Reduced Output

BY STERLING H. BUNNELL *

THE recent peak in the curve of steadily rising prices has been followed by a sharp descent in the values of some commodities, and at least a tendency to a decrease in the asking prices of all the others. Undoubtedly the scaling of excessive profits has permitted some portion of the reduction; but material and labor, the basic elements of all costs, in due course must participate in the downward movement toward pre-war figures. A period of rapidly declining prices is always one of reduced production and consumption and of general hardship. If at this time the managers of industries, even among the many perplexities of the present situation, will take time to analyze the causes of the readjustment which is in progress, and then to assist the workers in their factories to understand what is going on and what must be their part in the general cost reduction, the time of hardship may be very much shortened, and wasted effort and destruction due to class strife may be avoided. Certainly things cannot be cheapened by making less of them; nor can a year's earnings be increased by losing weeks and months in strikes for rates that cannot be granted.

Inflation and Prices

It is, of course, impossible for a man, or a nation, to continue indefinitely to spend more than comes in. Whenever there is excess of expenditure over receipts, debts are contracted and retrenchment and saving must follow or bankruptcy will result. The great cause of the general rise in all costs during the years of war was the inflation of currency and credit, as has often been said. But the cause of the inflation was the will of the people to expend an enormous effort to carry on and win the war. Men refrained from buying clothes, repairing their houses or building new, and spending their average proportion of income for matters not strictly necessary, in order to devote their efforts to war purposes and save a portion of their earnings to lend to their country. Some subscribed to the national bond issues on a scale which would require continued saving for a term of years to pay their debt. All citizens thus put themselves under compulsion to produce more than they should consume, and pay the difference to their Government in taxes over as many years as necessary to pay the debt in full. Every man in this way was set back several years in the orderly progress of his fortunes. He who postponed purchases or repairs must now make good even further deterioration; while all must pay out for taxes, direct or indirect, money which they would otherwise have been able to keep for their own. And the worker whose wages are not enough to require him to pay an income tax, nevertheless does pay the taxes which are added to the price of every article into which taxed material or taxed profits enter.

In the face of these facts, it has been rather astonishing to observe that since the armistice no one has seemed to be working as hard as before the war or consuming as little, whereas the opposite condition was demanded. Things simply could not go on in this way forever. The ability of the average man to do less and spend more was gained at the cost of constantly increasing inflation. His goods or labor could be marked up from time to time to maintain temporarily his margin over the high cost of living, but more money or credit had to be provided at each increase in prices. For many months the people kept on buying in undiminished quantities at any price asked. But gradually the increasing strain of making both ends meet forced a general refusal on the part of the public to make purchases. The retailers, who purchase goods to sell to the ultimate consumers, were the first to cut prices in the effort to keep their goods moving and so to maintain the expense of their establishments. The wholesalers, commission merchants and all others who purchase commodities in large quantities and borrow heavily from the banks on the security of their stocks, were required by their banks to anticipate a general fall in prices by selling their goods and paying off the loans. The crest of the wave of high prices had evidently passed, and as always when prices seem about to decline, all buying practically ceased. Manufacturing has been checked, in the absence of buying orders, and operating expenses are being reduced by laying off the less efficient workers, with the natural result of causing the remainder to do their best and so to turn out more work per man.

The return of personal thrift is the outstanding feature of the present movement. If it is continued and developed into national thrift, our debts will begin to be paid and our national wealth and prosperity to increase. To this end we must not only produce more than we consume, but we must produce a larger proportion of those things which in themselves serve to increase production, such as tools and machinery, factory buildings, transportation equipment and labor-saving devices of all kinds. All these are capable of forming elements of useful industries, which in operation will afford other men the chance to earn a living and carry a share of the taxes necessary to pay off the national debt in course of time. Most of all, no time should be lost by idleness; every worker is needed to produce to the best of his ability to make up for the heavy losses due to the waste of war.

No Heavy Stocks to Absorb

How long is the present slackening of production likely to continue? If there were large stocks of goods on hand, it might take a year or more to absorb them in industry. But at present all stocks are small. Factories which are just now running on half time report great difficulty in getting even the reduced quantity of material needed. None of the pre-war stocks has been replaced. Orders for stock goods have been canceled in great number, not because there is sufficient stock on hand, but in the hope of being able

*Consulting engineer, 103 Park Avenue, New York.

to place new orders at lower prices. The world is still wofully short of foodstuffs, coal, steel and tools and implements, and the slightest slackening of American industry can only increase hardships in other countries as well as our own. The depletion of the small stocks of essentials on hand might indeed cause a sharp rise in prices, which would still further disturb the world market and increase distress. It is to be hoped, therefore, that resumption of production, which cannot be long delayed, will take place soon enough not only to prevent spasmodic jumps in prices but also to establish a permanently lower basis of cost.

It is, in fact, highly desirable for every one concerned in industry, whether as laborer or proprietor, that costs and prices shall be substantially reduced. This does not imply a complete return to pre-war conditions. Much money has been spent in improving factory building and the surroundings in which work is done, and much has been laid aside by the workers themselves in home comforts and personal property of all kinds. But a large part of the increase in wages has only served to increase the cost of living because of the greater labor cost involved in the production and distribution of necessaries of all kinds. Conversely, a general reduction in wages and profits will not disturb the balance between income and cost of living. A general decrease in all costs would undoubtedly stimulate purchasing and therefore production in all lines, and so would be directly helpful in giving every man a chance to do his utmost in industry for his own and the common benefit.

Conditions Should Be Put Before Employees

If this situation can be clearly explained to working men and women everywhere we may confidently expect the quick advent of activity in business. At this moment a general effort by all employers to put the situation before all employees would undoubtedly be successful. In the first place, cutting prices to increase sales is familiar as a commonplace of modern advertising and selling methods, as every dweller in city or town knows well. In the second place, the education of working men in economic principles has progressed considerably in the past two or three years. They have seen that increase of wages may improve the conditions of living, but then by forcing other increases of prices may make things worse than before; and they have also seen that unprincipled exploitation and fraud is no more tolerable when practiced by labor leaders than by employers, and so have become more willing to think for themselves about the effect of changes in wages and other conditions of work. Thirdly, the lesson of the vital need of maintaining production even under bad conditions has been thoroughly taught to all but a very few unbalanced theorists and the more ignorant mass of unskilled labor, by the anarchy and starvation which have resulted in Russia, a country of enormous natural wealth, from the general cessation of industry.

At this particular time a definite and positive effort should be made by every employer to put the elemental economic facts before the workers in his plant. They have been talking among themselves during the last two years more than ever before. The instruction given them by their leaders has not all been good, though undoubtedly not as bad as formerly, since the leaders themselves have learned from recent experience. Americanization is proceeding by the efforts of public spirited citizens among the foreign born and foreign speaking of our people. Commercial and technical instruction in night or correspondence courses are increasingly successful in reaching a large number of men and preparing them to do better work. The habit of study and thought is not as uncommon among wage workers as it was a few years ago. It will not be difficult to interest them in thinking correctly about a topic as universally interesting to every one of them as the "H. C. L."

Many managers and superintendents have already begun the education of the forces under them by personal effort and contact, as well as by circulars and pamphlets, talks or lectures, moving pictures and other aids to understanding. The employers who are unwilling to take the trouble at this time to lead their work people along right lines may be responsible for a period of disastrous strikes and heavy losses to capital and labor together. The free-silver infatuation was educated out of the ordinary citizen by the concerted effort of leaders of thought who could grasp the principles, while the common man saw only that with more silver dollars in his pay envelope he could complete the payments on his installment purchases sooner. The same thing can be done again to-day, and probably more easily. Even the habitual striker dreads the order to quit work, the period of existence on a strike pittance, while his household goods go gradually into pawn, and the long struggle to get out of debt afterward. More than one factory has been reported as enabled to resume work after a recent shut-down, by the act of the workers in accepting a reduction in wages in preference to idleness. A general effort by all employers to put the economic facts before the workers and show them that lower wages and greater production must necessarily produce greater prosperity and better standards of living for all, may add even billions of dollars to our national wealth in the near future.

Engineers' Club of Youngstown

At the regular December Meeting of the Engineers' Club of the Youngstown District held at the Club Rooms, Park Theater Building, Dec. 28, the following officers were elected for the year 1921: President—C. S. Robinson, vice-president and general manager Youngstown Sheet & Tube Co.; vice president—W. C. Coryell, consulting engineer General Fireproofing Co.; directors (term of two years)—E. F. Vogel, superintendent coke plant, Youngstown Sheet & Tube Co., Mark Pendleton, superintendent Shenango Electric Co., Sharon, Pa., Howard Bishop, chief field engineer Sharon Steel Hoop Co.; trustees (term of two years)—F. E. Kling, chief mechanical engineer Carnegie Steel Co. (Youngstown District), E. T. McCleary, assistant general superintendent Youngstown Sheet & Tube Co.

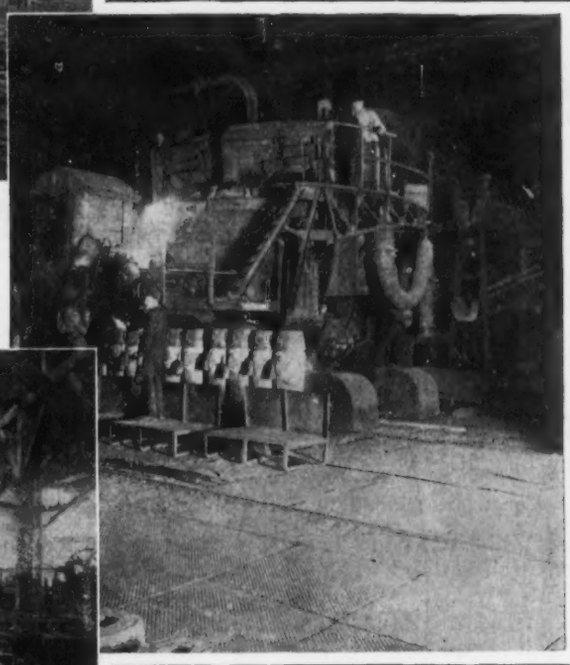
Frank Waterhouse & Co., Seattle, Wash., announce the publication of the sixth annual edition of "Pacific Ports," a manual of 750 pages, dealing with facts of Pacific trade. The subjects covered include: Financing foreign trade; packing for export; export trade marking; private international law; how to make an export shipment; foreign and domestic trade terms; marine insurance; terminal facilities and charges at Pacific ports.

The Lincoln Twist Drill Co., Taunton, Mass., a subsidiary of the Greenfield Tap & Die Corporation, Greenfield, Mass., which has been closed, has resumed operations with a full quota of help, but on slightly reduced time. During the shutdown, the plant's equipment was thoroughly overhauled and a new grinding machine installed. Edward Blake is manager.

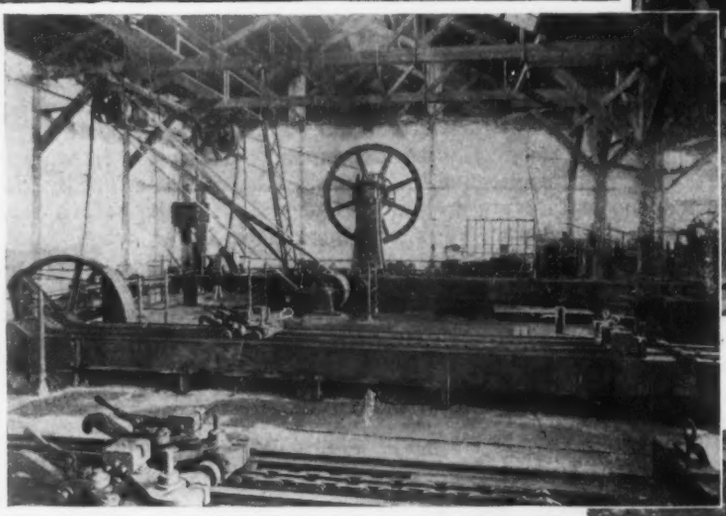
Views in the Kladno Works of the P

THE Poldihütte were founded about two generations ago in the ancient town of Kladno (Bohemia) chiefly for making crucible and special steels. Buildings and furnaces were added from time to time, and a large and thoroughly modern plant has now been erected at Komotau. The two works have a combined melting capacity of approximately 8000 tons per month.

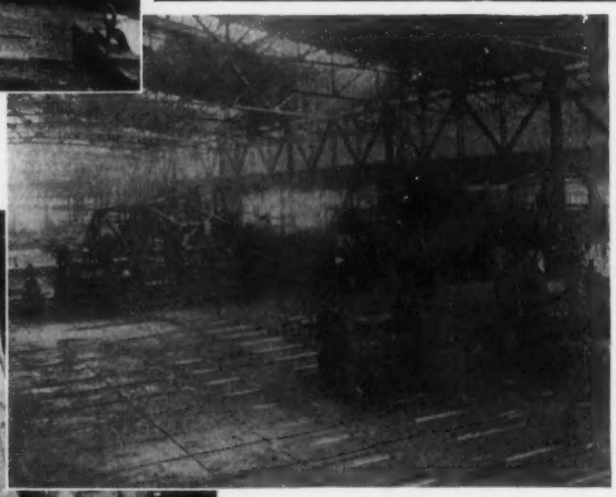
Billets Are Made Up to 6¼ In. Square and the Yard is Served by a Traveling Gantry Crane



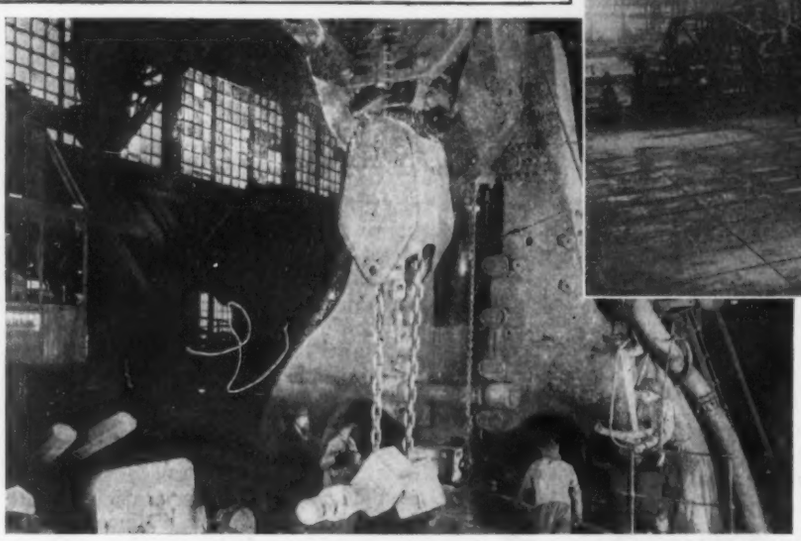
15-Ton Frick Induction Electric Furnace in Open-Hearth Furnace Department



Draw Benches Have a Range of ½ to 2 In. in Rounds



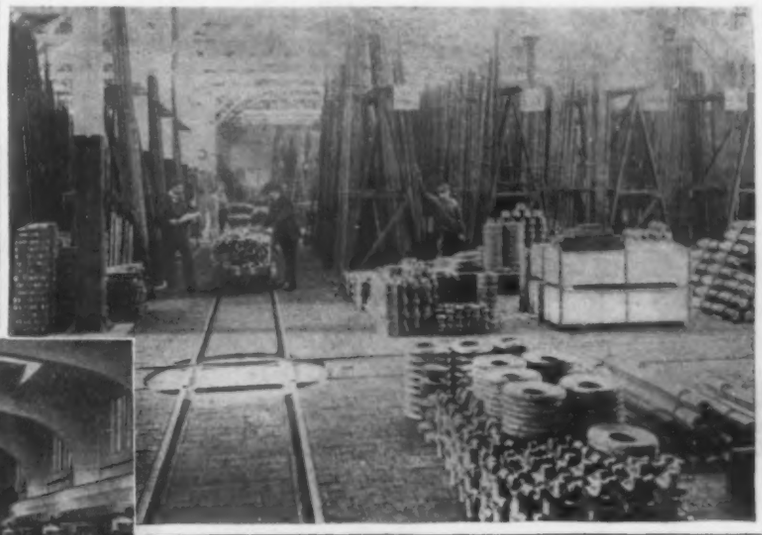
The Floor Plates on a Level with the Rolls Are Characteristic of European Rolling Mills



One of the 40 Steam Hammers, Showing the Handling Mechanism

Poldi Steel Works, Czechoslovakia

Besides high speed steel, the company makes rolled, drawn and forged products. Its equipment includes hydraulic presses up to 2500 tons capacity for producing forgings up to 22 tons in the finished piece; drop hammers and power presses; machine shops with about 885 machine tools and rolling mills for a range of 3/16 in. to 6 in. in bars.

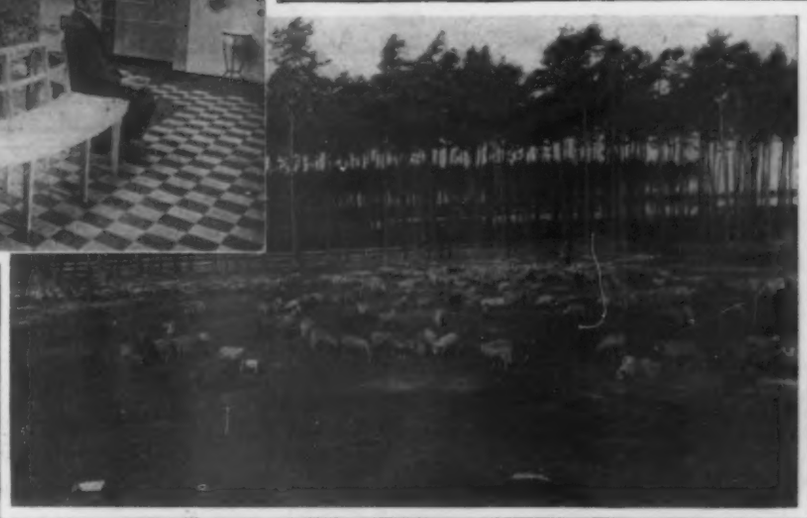


Part of the Shipping Department Showing a Use of Industrial Tracks

One of the Machine Shops

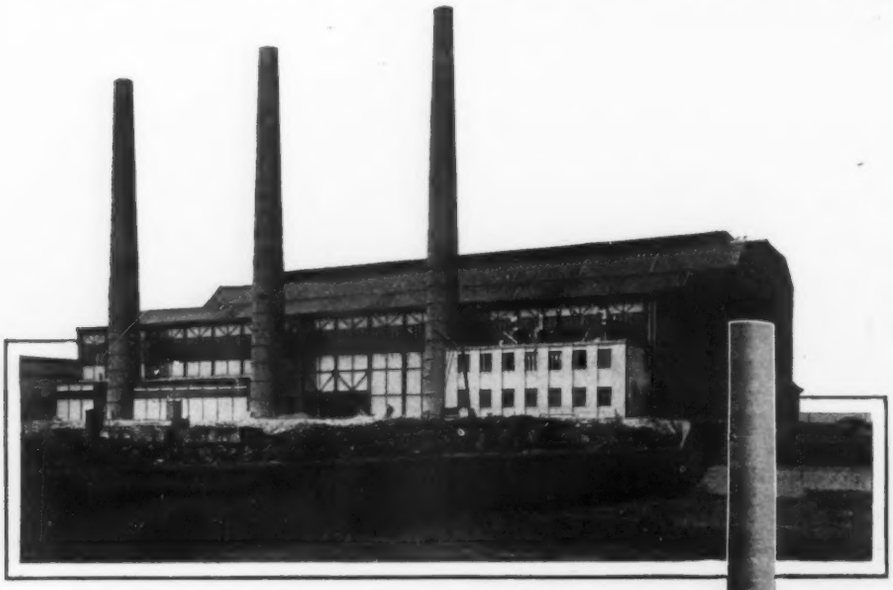
This Portion of the Physical Laboratory Is Indicative of the Character of the Laboratories in General

There Are 3000 Employees at the Kladno Works and 1500 at the Komotau Works. Hospitals, dining rooms and kitchen, barracks and private homes for some of the workmen and a fire department are provided



Near the Plant Is a Stock Farm Maintained for the Benefit of the Employees

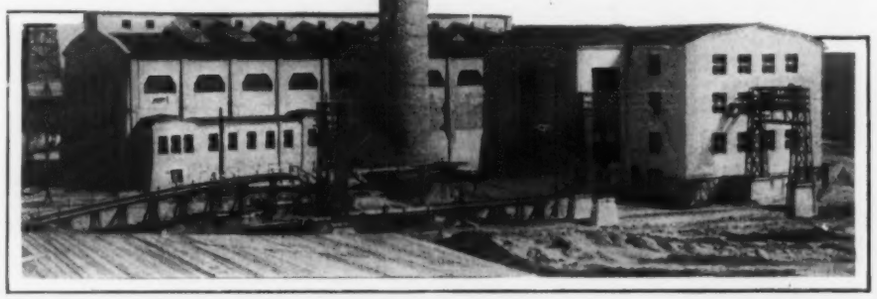
Komotau Works of Poldi Steel Works, Czechoslovakia

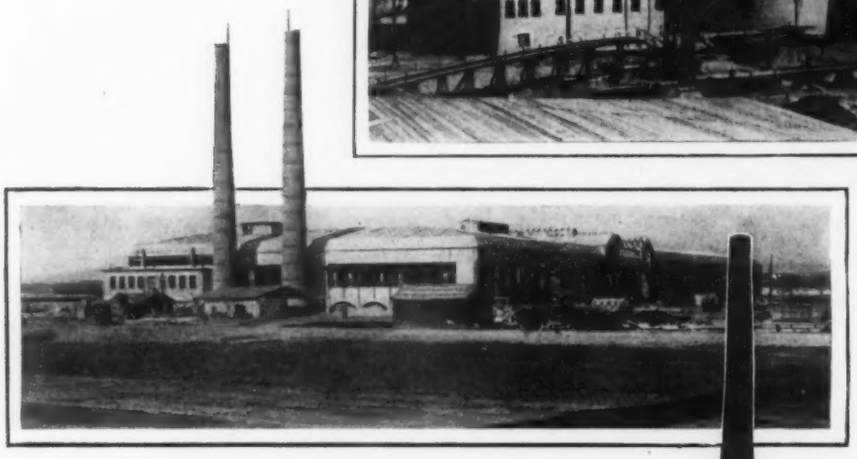


THE Komotau Plant Was Founded in 1916. Near it are coal mines of the company and in Bohemia the company owns tungsten mines

Both this and the Kladno plant specialize on tool steels, high-speed steels, alloy steels, in sizes or sections desired, and cold drawn, hot rolled or hammered, from small drill rods to large forgings

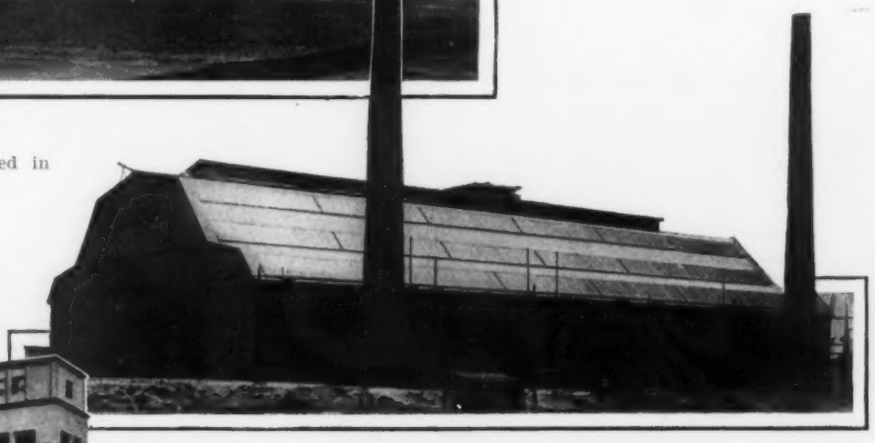
Open Hearth and Electric Furnace Building

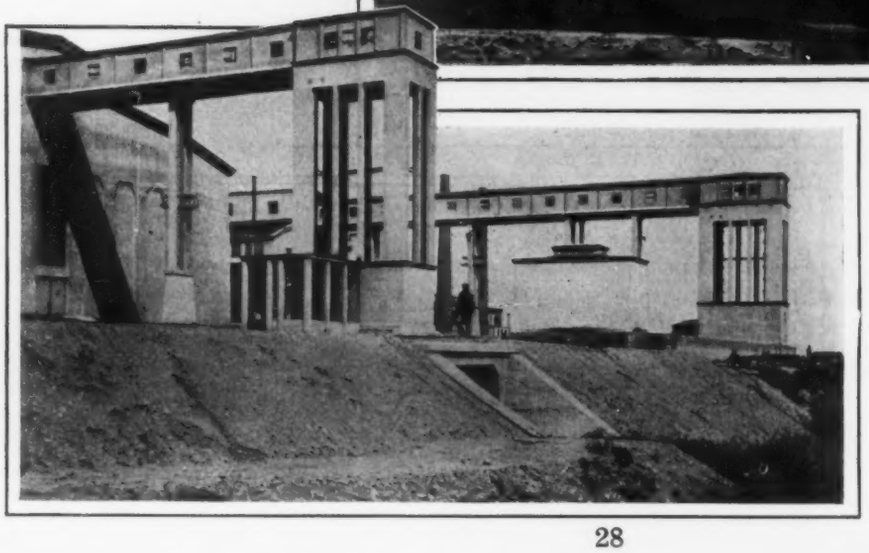




Boiler House and Power Station Containing Babcock & Wilcox Boilers and Turbine Driven Generators

The Rolling Mills Are Housed in This Building





Forge Shop and Rolling Mill Building

At Left, Housings for Coal Conveyors from Railroad to Power House

New Foundry for Making Mill Brasses

Plant Erected at Youngstown, Ohio, by Lumen Bearing Co. for Producing General Steel Mill Non-ferrous Castings

THERE is probably no type of bearing that is subjected to more severe conditions than rolling mill brasses. Temperatures are invariably high, speeds are generally above normal, while pressures are particularly severe. According to Kester Barr, manager of the Youngstown plant of the Lumen Bearing Co., three factors enter into the mill brass problem; namely, the chemical and physical characteristics of the bronze, the care and accuracy with which it is molded and cast, and the rigidity with which it is inspected.

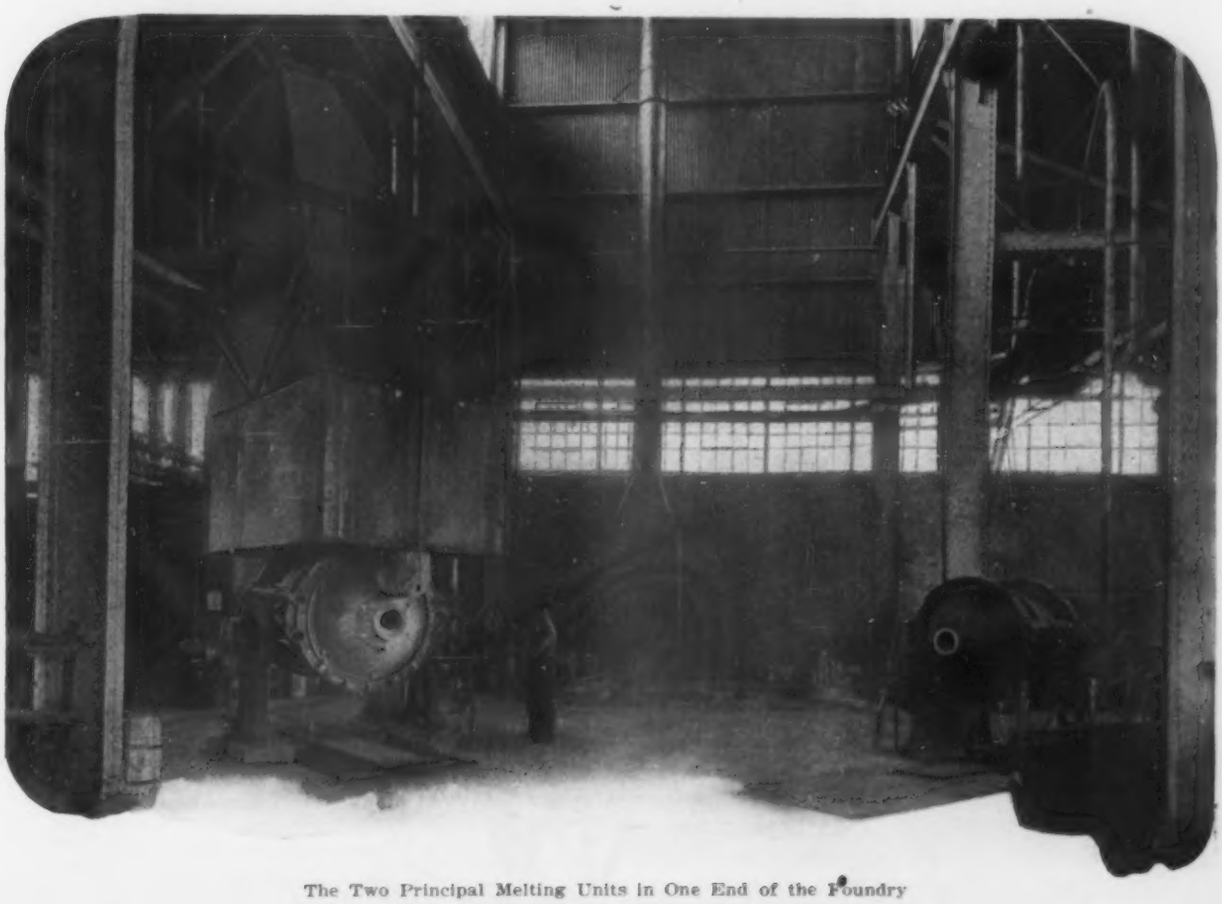
For twenty years the Buffalo division of the Lumen Bearing Co. has been producing bronze castings under the direct supervision of a metallurgical department. Among the first to apply scientific training to this industry, the company has developed its chemical and physical laboratories to the point where they are known through the technical information which has been contributed to engineering societies on the basis of work done in them. This includes notable photomicrographic work.

The company's investigation of the brass and bronze requirements of the Pittsburgh and Valley districts showed a field in which opportunities for the maintenance of a permanent business could be counted on. The company believed that its history in Buffalo warranted special consideration to the production of steel mill brasses and bronzes, and it selected Youngstown for its branch or subsidiary plant.

The new foundry is of the monitor roof type, of brick, steel and concrete construction; high, light, well ventilated and heated. This plant is operated by the same group of men that operates the Buffalo plant, having, however, its own manager and superintendent, with freedom in regard to deliveries and service. It is an Ohio corporation. The plant is located on Poland Avenue, on the Canfield branch of the P. Y. & A. Railroad, south of the Republic Iron & Steel Co.'s tube mill. The main building measures 105 x 140 ft., and has been equipped to handle 2,000,000 to 3,000,000 lb. of castings per year. The foundry is equipped to produce any brass or bronze castings required by the steel trade.

The land purchased comprises about 2½ acres, permitting easy expansion on a shallow soil lying over the native rock. Foundation construction is simplified by the location. The railroad siding was held up 20 ft. above foundry grade—a feature which permits easy unloading of sand, fuel and metals. As all the material is handled into the plant by railroad cars and out by truck, this peculiar location of the adjacent railroad was taken advantage of in this way. Fuel oil is drained by gravity into tanks on grade level, housed and steam-heated. Metals are chuted directly to the metal room scales within the main foundry.

Fuel oil is used for melting. It is delivered by pumps to an auxiliary air tank, in which it is put under air pressure up to about 40 lb. This part of the equipment is housed in a brick and concrete structure, the auxiliary tank being placed below grade level to permit back draining, if necessary. The entire system is protected by Lalor valves that automatically close on a sudden relief of pressure in the line, as



The Two Principal Melting Units in One End of the Foundry

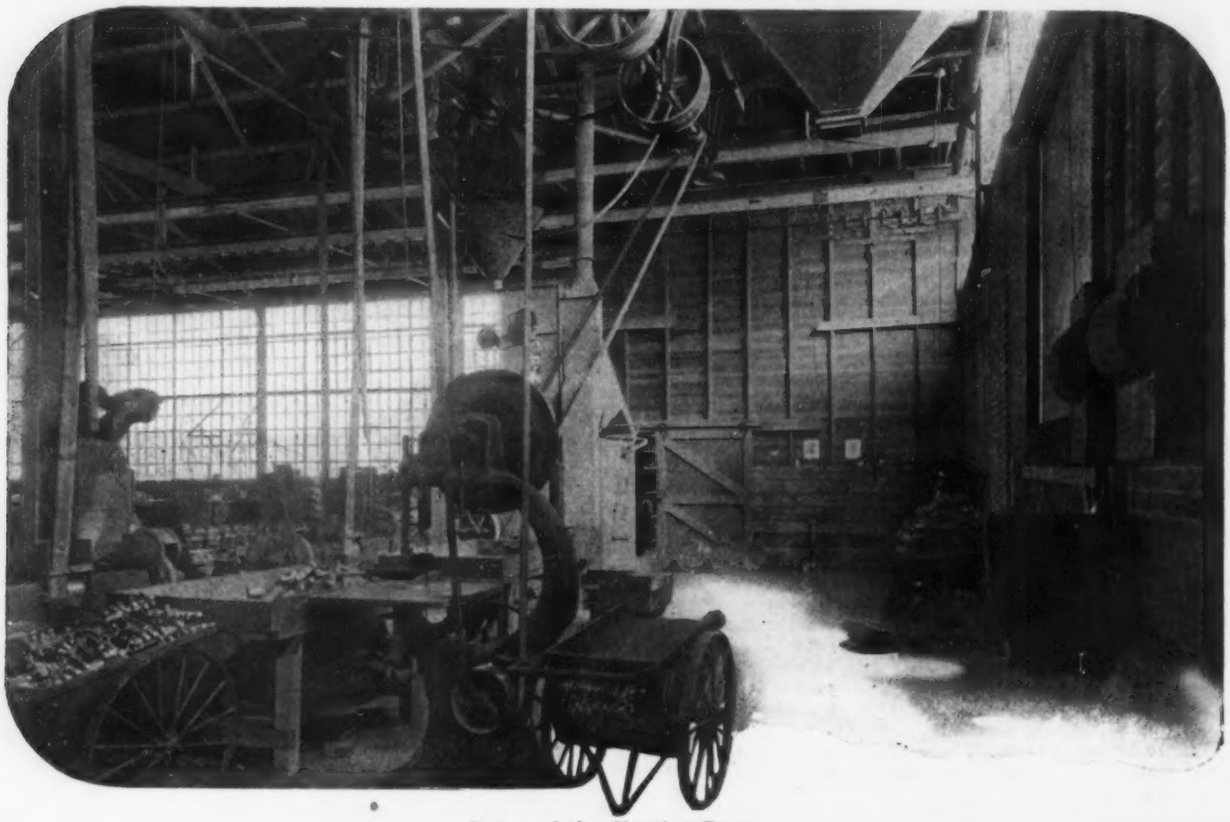
In This Corner of the Core May Be Noted the Molding Machines Used

happens in case of line breakage. The whole fuel oil system is enclosed and protected from freezing by a low pressure steam plant. This practice is also of great importance in maintaining uniform melting conditions.

The principal melting units are two U. S. smelting furnaces, shown in an accompanying illustration. There are also six crucible pits intended for small heats, or special metals, or for use in an emergency. Ladle and crane equipment are adequate to pour castings up to 5000 lb. in weight.

The main bay is served by a 10-ton Euclid crane. A monorail system covers both side bays, serving hand pour-off cranes for the lighter castings. The view of the center bay is taken looking toward the cleaning room and away from the main melting furnaces.

The side bay carries the core room and the molding machines. This item of equipment is the important feature in the problem of making accurate castings. The patterns are mounted on iron or steel plates, and held exactly in place when the sand is rammed home. Only by this method can patterns be withdrawn cleanly from the mold, with a minimum of draft, and the consequent saving to the buyer. This is the bay in which mill brasses are made. It is due to the constant improvement of its molding machine practice that the Buffalo division has been able to reduce its defective casting returns to 0.85 per cent, or 85 in



Corner of the Cleaning Room

10,000. The Youngstown plant hopes to do better than this, as it becomes acquainted with its men.

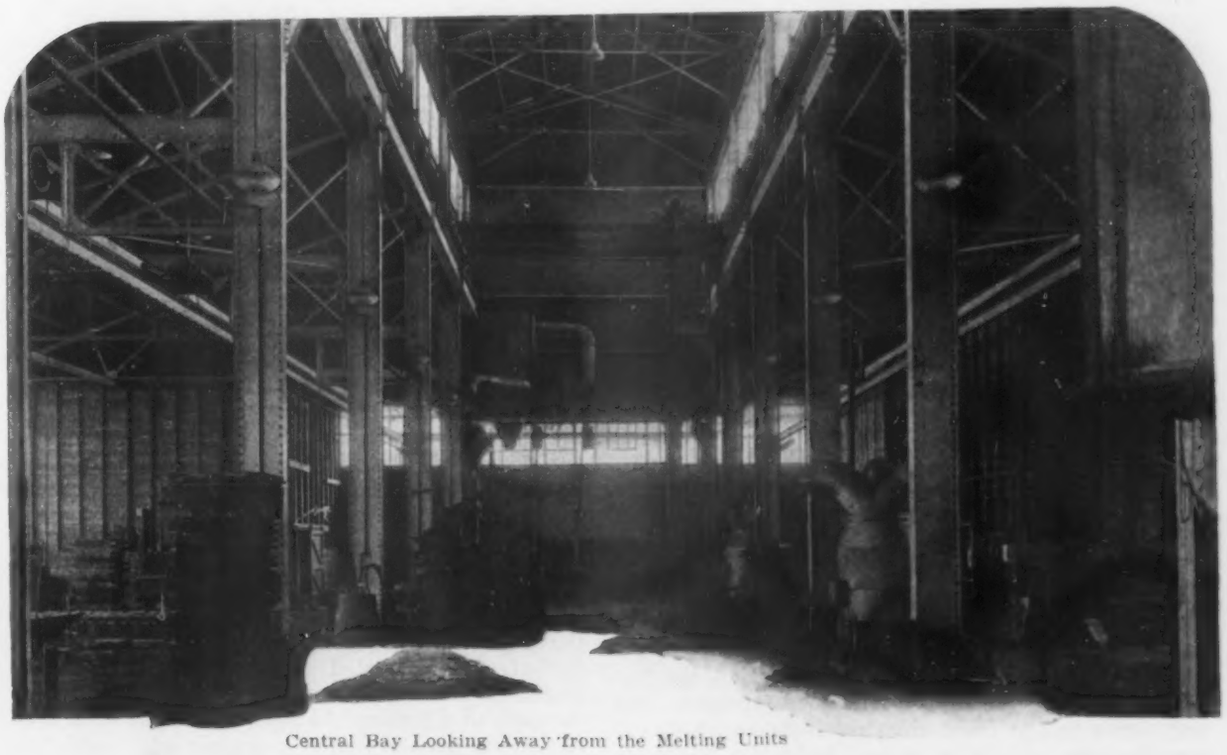
The view of a portion of the cleaning room shows band saws, grinders and sandblast equipment in keeping with the idea that castings must be clean of fins, gates, risers and sand before they pass to the inspector. The inspector has full authority in rejections, subject only to the manager's revisal. The castings are compared with blueprints to insure corrections.

The south bay of the main foundry building has been converted into metal room, pattern shop, machine shop, locker room and office. The floors in these subdivisions are of concrete and the walls of heavy studding and with tongue and groove siding.

The pattern shop is equipped with power saws, planer and lathe and takes care of all pattern up-keep, wood flasks, jumps, boards and the various items of this kind.

The machine shop contains lathe, drill press, saw grinder, shaper and the necessary small tools. The air compressor is located in this department. Compressed air is piped to the molding floors and to other points in the plant.

The locker room provides the comforts and conveniences that workmen appreciate. It has lockers, showers, wash basins and toilets. Lunch tables and benches assure comfort at noon-time. All these departments are heated by hot air blast.



Central Bay Looking Away from the Melting Units

At Youngstown, demand for brasses and bronzes will probably be met by a distinct range of standard copper-tin bronzes, and the company has indicated its idea of service by listing the following:

Mill brass A—for high speed finishing mills on strip, skelp, hoop, wire rod, small rounds and for similar severe service.
Mill brass B—for bar, sheet and plate mills.
Mill brass C—for miscellaneous bearing service.
Mill brass D—for general use where brass is specified without distinct reference to bearing service.
No. 2 bronze is recommended for hydraulic work, pump bodies, valve parts and high duty work of this character.
No. 3 bronze is recommended for acid resisting work, as in sulphurous acid solutions.
No. 10 bronze is used for bearings in cranes, motors, machine tools, shears, presses and general machinery.

Kester Barr is manager of the plant. L. B. McKelvey, Thomas Parrock, B. G. Parker, and J. Fernley Bonnell, with the manager, comprise the resident directorate. The officials of the company are William H. Barr, president and treasurer; C. H. Bierbaum, vice-president and consulting engineer; N. K. B. Patch, secretary, and H. P. Parrock, general manager. The officials, with the local directors, are directors of the Youngstown plant, and are also the directors of the Buffalo plant. L. S. Jones is general sales manager for both plants.

Will Postpone Operation of Steel Mill

Operation of the new four-mill sheet plant of the Chapman-Price Steel Co., at Indianapolis, Ind., will be delayed temporarily pending improvement in business conditions. One of the new units has been converted into a jobbing mill. The plant will have an annual productive capacity of 24,000 tons of black and galvanized sheets, most of which will be consumed in an extensive fabricating department adjoining the sheet mills, and equipped for the manufacture of gutters, troughs, eave-spouts and a wide variety of pressed metal products. The plant consists of four main buildings. Installation of equipment is being completed. J. J. Beck, formerly superintendent of the sheet mill department of the Youngstown Sheet & Tube Co., Youngstown, Ohio, has assumed his duties as vice-president in charge of sheet mills and galvanizing department. The plant was designed by Leif Lee, consulting engineer of Youngstown.

The Rigby Valve & Machine Co., Inc., 214 Bridge Street, Sharon, Pa., was recently incorporated with a capital of $50,000, and will manufacture the Rigby liquid fuel regulating valve, the invention and patent of A. V. Rigby, formerly assistant general superintendent of the Farrell, Pa., works of the Carnegie Steel Co. This valve is designed for the regulation of liquid fuel in open-hearth and heating furnaces and boilers. In addition the company will operate a general machine shop and a grinding works. The company is headed by A. V. Rigby, with M. P. Shaw, secretary and treasurer, and John C. Pernch, E. H. Stewart, H. E. Massey and F. Merk, directors.

A meeting of manufacturers, merchants, railroad officers and shippers will be held at the Congress Hotel, Chicago, Jan. 12, under the auspices of the Illinois Manufacturers' Association. Topics which will be discussed include the open shop and immigration.

Training Foremen in Production Methods

What Is Needed and What Has Been Done—A Work that Should Precede Any Attempt to Provide the Machinery of Self-Expression for Employees

BY JOHN CALDER*

THE metal and machinery trades were among the first to profit by the use of the scientific method in the study of plant management. Introduced in a very few metal working plants nearly twenty years ago and confined to the scientific arrangement of machinery, materials and operations, it was confidently predicted by its pioneers that adequate production and high earnings by picked workers would satisfy both the employer and efficient employee and that no other factors need be considered.

Origin of Industrial Relations

In the two decades which have elapsed we have learned otherwise; the scientific method applied to system and to the material things in industry has not stabilized it. It is now being realized that the method is equally applicable, though more approximately, in handling the people in industry and it is no longer identified with any particular system. It is being borne in upon us that what the worker wants is not what the scientific manager of about twenty years ago with the best of intentions proposed to give him; nor is it what numerous employers have bestowed or would like to bestow to-day. The application of the scientific method to employment management, to labor turnover and to industrial social service, is fully justified by its results, but the mere handful of major officials who have proposed these measures cannot, even if they would, stabilize a labor force which is really governed by a staff of unenlightened foremen.

What Is on the Worker's Mind?

The workman to-day wants and always has wanted just four things in particular, in the order named:

1. A steady job.
2. Adequate pay.
3. A good foreman.
4. A voice about his conditions.

All of these are now receiving attention, but the third—insuring the supply of a good foreman—has only come to the front comparatively recently. It was brought vividly to our attention by the dilution of both foremen and workmen during the war. Since the pressure of war necessity has ceased to justify extravagant ways of handling things and people, it is more than ever to the front as an absolute necessity in the reconstruction.

Various schemes of representation to meet the fourth item—a voice in working conditions—are in use, but the best way of all to meet it is to do an especially good job in the matter of the foreman. To energize and enlighten him and to multiply the liberal policies of the management through him is a safe earnest that the workman will gain all his reasonable objectives and will be open to conviction about any unreasonable ones.

The Inefficient Supervisor

But if these are really the things the workman wants "what then," we are asked, "about profit-sharing, management-sharing, bonuses for improvements and economies, and numerous other plans that are proposed by zealous employers?" The answer is that none of these plans is on the worker's mind; that none of them can take the place of the four primary wants which have been named.

The steady job, adequate pay and a voice in settling his conditions are in the last analysis determined for the workman by the actions of the foreman—the man in front—the man next the man who delivers the goods. Even the most liberal-minded owners of plants will get no further than the caliber of the foremen who represent or misrepresent them before the men. In the acute unrest in England after the war, in our own steel strike, and in a hundred other instances, the evidence of employers, arbitrators and workmen alike boiled down the facts to one chief cause within the plants themselves—arbitrary supervisors acting sometimes without, and often with, the knowledge of their employers.

The Foreman Is the Company

This condition of things is not an indictment of the foreman but of his employer. The foreman is or should be the chosen representative of his company's policies and ideals regarding labor. Some object to putting the foreman on this pedestal and claim that other ways should be employed to manifest interest in employees; nevertheless, the actions and views of the man immediately in authority over the workers and constantly in touch with them are their ultimate criterion of the company. This is the universal testimony of those who know the workman.

What Is to Be Done About It?

First of all, of course, the concern must have such policies and ideals; and we are confronted with the fact that not a few companies which have dallied with elevated sentiments on how labor should be treated have never thought these matters through to a finish. At best their system is a collection of uncoördinated practices of liberal tendency, sometimes too liberal and the result of the initiative of management; sometimes not, and really on trial so far as the proprietors are concerned. It is far better, to begin with, to admit that a concern has no settled policy, has arrived at no certain convictions about the stabilizing of industry through education, than to indulge in a little of some one else's magic on the gamble that it may work while the management looks on.

A board of directors and a management thoroughly convinced that labor relations need stabilizing and can be stabilized is inevitably confronted to-day by the question, "What are we going to do about the foreman?"

The Distribution of Foremen

According to the last published Census of Manufactures, about forty millions of our population are engaged in gainful occupations, and nearly eight millions of those are in manufacturing industry.

*Manager of industrial relations, Swift & Co.; director of "Course in Modern Production Methods."

A little more than one-half of all our industrial workers are engaged in 270,000 establishments comprising 98 per cent of our total plants, and these plants employ from 1 to 250 people, or an average of 14 persons. The remainder, a little less than half of our workers, are employed in 5104 places, only 2 per cent of all our plants. Three thousand of these plants employ from 250 to 500, and 1400 employ from 500 to 1000 persons each. Only 648 plants in the country run over 1000 employees each and form what we term "big business."

The situation, then, is that fully half of our foremen, assistants, inspectors, superintendents and managers, or about 400,000 persons, and somewhat less than half of our industrial activities and services, is carried on in establishments so small that if the employees and managers were energized, sympathetic and enlightened, there would be little difficulty in creating and maintaining very close and satisfactory relations with labor. As a matter of fact, however, little use is made by small proprietors of this advantage.

The other half of our foremen and minor executives, numbering over 300,000 persons, in relatively large establishments, are often far removed from any real contact with their concern's policies and ideals and depend upon the accident of a particularly able and progressive management for enlightenment. This does not make for continuity of action in labor matters; in fact, the checkered labor history of some concerns is just the history of their successive managers of varying capacity and character.

Take the Foreman Into Confidence

The foreman must be told much more about his concern and what it stands for than he is now. He must be told the truth, the whole truth, and nothing but the truth about its affairs as they concern manufacturing conditions. In most cases he has no adequate idea of its policies and its problems—no one has taken the trouble to tell him; and it is still more the case with the worker. Judicious plant publicity will help with the latter, but the foreman should be taken right into the family, be permitted to discuss these things, and get closer to them than bulletins and such will bring him.

Sometimes the industrial decisions of concerns are merely opportunist and reflect no steady policy, no settled convictions. The foreman's main job is to handle his men with technical efficiency, tact and general satisfaction. He cannot do this without confidence, and is frequently handicapped by its absence.

Management cannot escape the responsibility of building up that confidence in every single foreman and of being worthy of it, instead of making the foreman the general drudge, responsible for all things that go wrong and credited with little when they go right.

Management must clearly define its policy to the foreman, and it must be a worthy and sincere policy, not merely something that looks well in the store window. We cannot humbug the foreman. We also must cease regarding and using him as a policeman and must deliberately set ourselves to aid him to fit himself for man-building, his real job—his greatest opportunity and the best investment capital can make in its own or society's interest. All of this procedure is simply the best kind of business.

Educate the Men of To-day

Some plant people place their faith in the new executive material coming forward, in the foremen of the next generation. But *we must educate the men we have;* the matter will not await their successors. Approximately 10 per cent of our 8,000,000 strictly industrial workers are in full or semi-supervisory positions. That is, we are running industry to-day with nearly 800,000 foremen, assistant foremen, inspectors, superintendents and managers between 22 and 65 years of age. These are the people, even where the employer is in full accord, who for good or ill hold the immediate future of labor relations in their hands, and it is their traits of mind and character which will determine the issue. If the combined efforts of enlightened employers, professional experts in industrial education and the liberalizing influence of "industrial relations" departments can succeed in energizing and enlightening the major portion of our industrial foremen and of their employers we need fear no labor developments that are inconsistent with out best American traditions. This applies equally to the foremen in our mining and transportation enterprises, who are not included in these figures, but who have a measure of labor trouble out of all ratio to their numbers in industry as a whole.

What Has Been Done

Of the 8,000,000 people engaged in our manufacturing industry about 2,250,000 are in the metal and machinery industries, and about 10 per cent of these, or 225,000, are supervisors of all grades. During the two years since the armistice a "Course for Foremen," which the writer has organized and directed, has been given in 400 plants of all industrial types to 25,000 supervisors, men who control over a quarter of a million people. Of these, 100 plants were among the metal trades and employed about 500,000 workers and 4000 foremen. Twenty-five thousand graduates in a little over two years constitute a fairly adequate experiment in what can be done to enlighten and energize the 800,000 foremen we have in industry to-day—men between 22 and 65 years of age, of all degrees of ability and education and typical of the average supervisor.

How It Was Done

The method adopted is different in a number of ways from the ordinary scholastic one. Education is the goal of both, but the foreman is not an adolescent, eating up knowledge. He is not like the dog that smelled the third rail—full of information in a moment. He is a "tired business man" who in many cases has long forsaken serious books and he must be attracted to them once more. He will study none of the ordinary professional literature on industrial management, because it does not speak his language and goes into a detail which is far beyond his needs and understanding. He must have texts especially written for him with practical problems on human relations and plant problems which appeal to both his experience and his new knowledge. He must become well posted in the science of human behavior. He must understand how much more people are moved by their feelings than by their thinking and how to use this knowledge to lead men to full expression of their best qualities. He must know the fundamental economics of founding, organizing and operating a plant and of the systems used in good practice. All of this must be conveyed in interesting fashion by texts and talks in terms of his own vocabulary and with ample illustration and story to carry home the points. The foreman, like the workman, is very literal and concrete in his thinking and the texts prepared for him must ever keep this in mind.

These cover a popular outline of the history of

industrial development; an analysis in simple terms of the executive qualities; self-applied tests on these; an analysis of the workman's traits and how to handle men individually in the light of these; the nature and use of organization aids in management; the organization and selection of plant materials and machinery; the creation and use of constructive records of stores, production and costs, and the value and necessity of "the paper work" of industry. Finally, industrial management in its essentials, as it touches the foreman, is expounded and he is enlightened upon the trials and tasks of "the man higher up."

A Typical Meeting

The foreman is allowed a chance "to talk back to the teacher"; to ask questions about his course and his company's affairs and have his curiosity satisfied on all subjects arising out of his reactions to the texts, problems, lectures and discussions, for which he has voluntarily enrolled. He needs the enthusiasm and support of numbers also; so that such a course is offered to the whole executive family in any plant, meeting immediately at the close of the working day, and regularly as a group on the plant premises. The manager and superintendent and any resident officers sit in and do the work also. This education is intensive and limited in any one course to four months. It must not encroach too much on the foreman's leisure and there must be no dull moments in it. These are the conditions which must be made when hardworking men of relatively small advantages in their youth are invited "to go back to school with the boss." This invitation is given at an introductory meeting where the whole plan is submitted to the assembled executives and the result left to their decision. It is invariably favorable, because it meets a long felt want among the men, and frequently they are willing to pay one-half of the expense themselves. This is usually repaid by the company to all foremen who complete the course. All meetings are held on the men's time, but without unduly encroaching upon it. A lunch every two weeks immediately at the close of the working day is followed by the group meeting and lecture, lasting 45 minutes. Recess is then taken for a few minutes, and open discussion follows on the subject of the text unit already studied for as long as desired, usually leaving all the executives at liberty before 7 o'clock in the evening. This has proved generally satisfactory where men scatter widely at the close of their work. In plants located away from the larger cities the class meeting is more of a special event and is frequently held at 7.30 p. m. and fills an evening.

All the details above mentioned relating to the convenience of the class arrangements are most important in dealing with the education of adults, and should be skillfully arranged by people with experience in this work.

Care was taken in these 400 classes to have the lecturers and examiners practical, competent and independent of the employer of the group. Thereby confidence in the impartiality and privacy of the tests was established; for men of years are sometimes, and quite naturally, skeptical of a movement of this kind at first. By this method all fear of personal reflection has been removed.

Results Obtained

In every location of plant, city or country, Atlantic States, Central States, Pacific Coast or Canada, the results were uniformly the same when the above conditions were accepted and the foremen's and executives' classes organized and conducted accordingly. Each foreman or office executive individually solved six problems on human relations and methods in industry; that is, about 150,000 solutions in all for the total number enrolled to date. The content of these solutions and the suggestions made in them are revealing as to the unwise confinement of the foreman to the role of man-driver and the creative faculties seeking an outlet. Employees and managers everywhere testify to the improved facilities of putting new ideas into the plant through such enlightened foremen and to an increasing spirit and practice of forbearance, tact and sympathy towards the workman which bids fair to win his confidence and willing coöperation.

It would be difficult to exaggerate the appreciation of hundreds of employers who have played intelligently and thoroughly up to this program whose motto is "Make Goods Plentiful and Men Dear."

As yet only the surface has been scratched but the writer believes that the above conditions must be fulfilled if we are to stabilize industry through its non-commissioned officers, and it is his conviction that it will not be done speedily if we leave it solely to the initiative and spare time of higher executives, however willing, who are usually inexperienced in the art of communicating knowledge and whose foremen and workmen are always more ready to be "sold" sound economics and humanics by the outsider speaking with authority.

The Aftermath

If we encourage and incur the hopeful penalty of education in our plants, we must be prepared for the consequences. The first is that we have started something which must be continued, and the second is that after such training nothing can ever be settled until it is settled right. Invariably such a group of energized and enlightened adults, with supervising responsibilities, ask at the end of such courses, "Where do we go from here?" and the usual result is the formation of a permanent self-activating foremen's study club, which opens up the way for continuous intellectual interest surrounding their jobs.

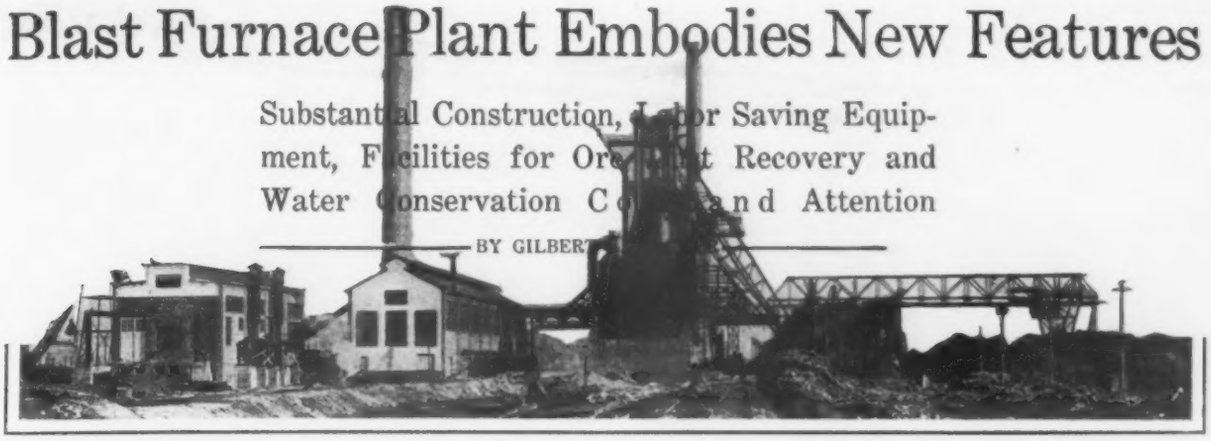
When we have done this for our foremen, we have created a valuable asset right in the plant in the shape of sympathetic teachers and leaders. We are then in a good position to spread the work to the rank and file of our workmen according to the degree of their natural receptiveness and a course has been prepared for them of a more elementary nature. Such work as here described seems to the writer to be fundamental and should precede all attempts to provide formal self-expression and self-determination for the workman in the matters which concern his interests. Sometimes the formality is unnecessary if he is supplied with the better type of foreman.

The metal trades in particular, which were the first to benefit from the application of the scientific method to industry, have necessarily many foremen of higher native ability than the non-precision industries. For this reason the further development of their foremen by education suitable to their circumstances and responsibilities is an investment at once profitable and calculated to go far to promote understanding and good will between capital and labor, at a time of inevitable adjustments due to economic conditions.

Blast Furnace Plant Embodies New Features

Substantial Construction, Labor Saving Equipment, Facilities for Ore Dust Recovery and Water Conservation Commend Attention

BY GILBERT



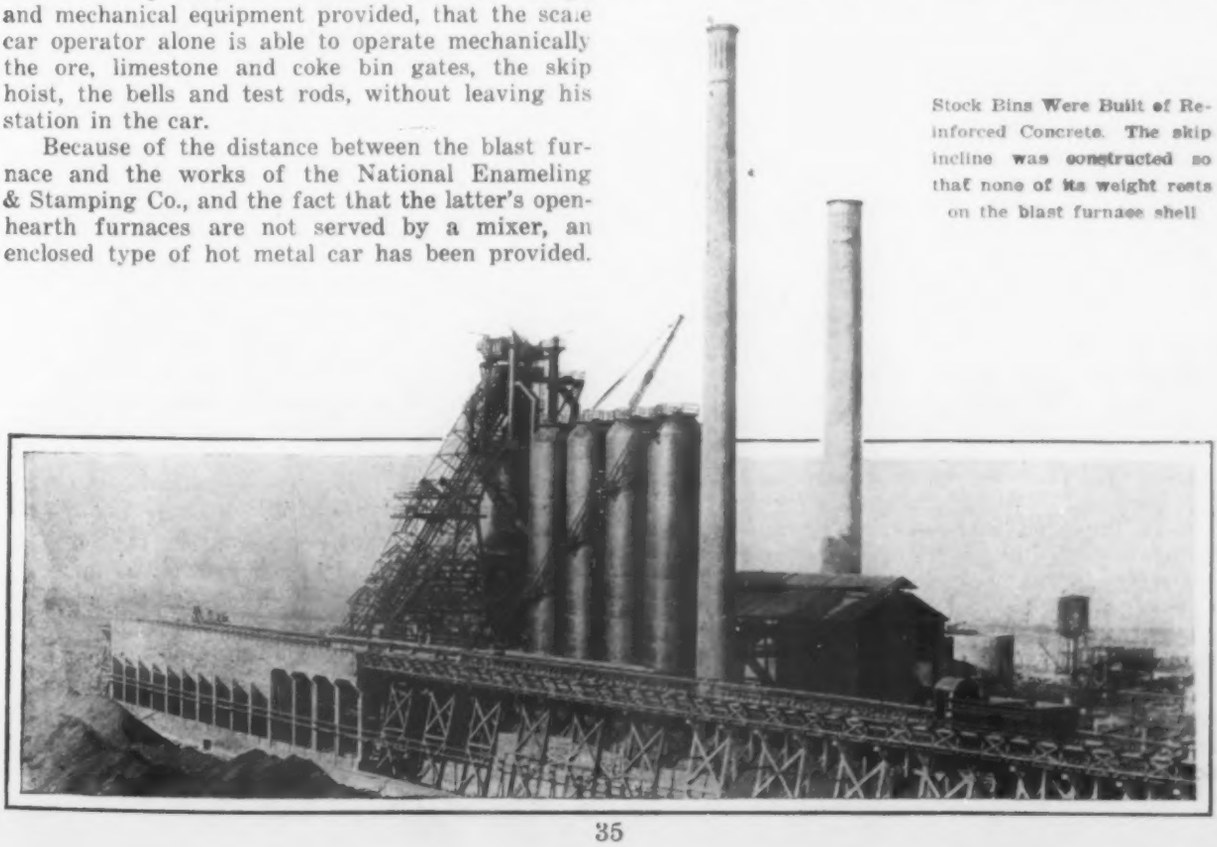
THE 500-ton blast furnace recently completed at the plant of the St. Louis Coke & Chemical Co., Granite City, Ill., will use metallurgical coke produced by the Roberts process from 100 per cent Illinois coal and will furnish hot metal to the open-hearth furnaces of the National Enameling & Stamping Co., an affiliated interest. The Roberts type by-products coke ovens, which adjoin the blast furnace plant, are nearing completion and will be described in a later issue of THE IRON AGE. The blast furnace, which was completed in December, 1920, is impressive because of its substantial construction, the completeness of its equipment and the new appliances and practices that have been introduced to advantage.

The permanent character of the construction is to be noted in the stove and furnace foundations, the stock bins and the pig casting machine structure, all of which are of reinforced concrete. New features are to be found in the chimney valve in use on the stoves, the stove burner and the gas washer. Provision has been made for the recovery of a maximum amount of ore dust from the gas, and notable economies in the use of water have been effected. In the stock bins, operations have been so simplified, both because of their design and mechanical equipment provided, that the scale car operator alone is able to operate mechanically the ore, limestone and coke bin gates, the skip hoist, the bells and test rods, without leaving his station in the car.

Because of the distance between the blast furnace and the works of the National Enameling & Stamping Co., and the fact that the latter's open-hearth furnaces are not served by a mixer, an enclosed type of hot metal car has been provided. A new type of boiler has been installed, and a high intake for the blowing units has been provided to reduce the amount of dust drawn in with the wind. The blowing unit incorporates a new design of turbine drive. The construction of the water reservoir is novel and is designed to provide an uninterrupted flow from the deep well pumps to the primary pumps.

New Type of Stove Burner

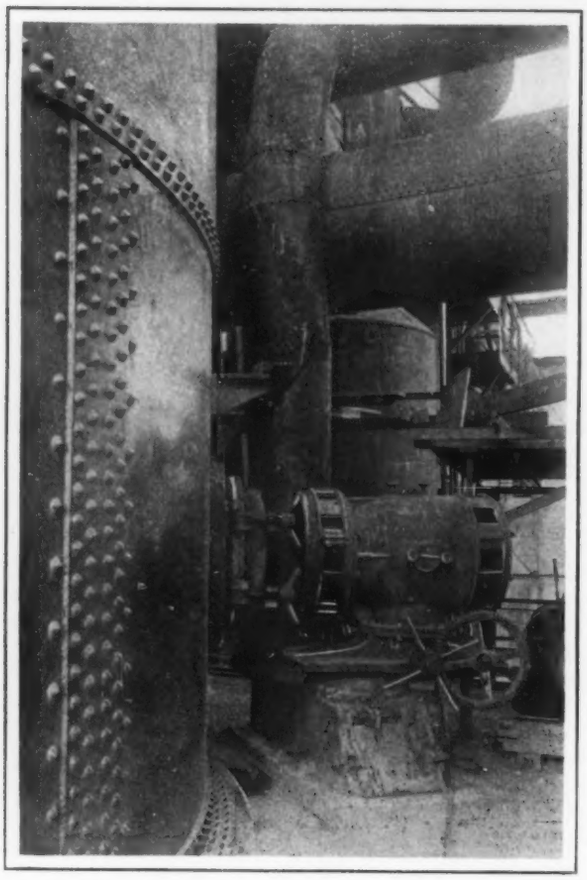
The burners in use on the stoves are of novel design. Their construction is such that the pressure of the gas in the main is brought to the opening of the nozzle itself, thereby producing a high velocity of gas at the aperture and a subatmospheric pressure, factors which combine to suck in the air required for combustion. The air and gas are premixed in a mixing chamber and consequently burn in the stove with a high flame temperature. A circular slide, located at the front of the burner, used to adjust the primary air, and a secondary air valve give the proper proportions of air and gas for combustion. There are four Brassert-Jones type stoves, 20 ft. in diameter and 100 ft. in height. The stoves have 4-in. square checkers, and the checker walls are 2-½ in. thick. The total heating



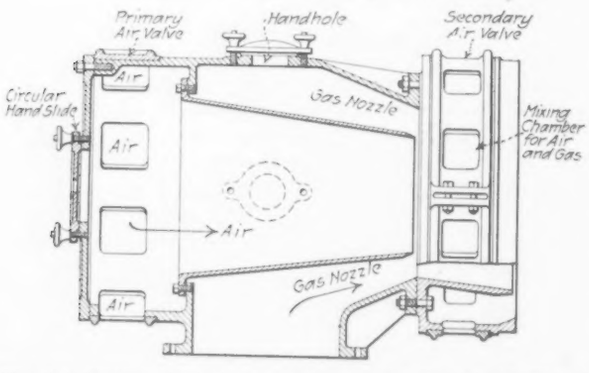
Stock Bins Were Built of Reinforced Concrete. The skip incline was constructed so that none of its weight rests on the blast furnace shell

surface of the four stoves is 246,000 sq. ft. They are provided with Sil-O-Cel insulation and are lined with Walsh fire brick. Each is equipped with a Mathesius hot blast valve, a Universal stove burner and two Weinel chimney valves.

The chimney valve in use on the stoves is an important feature of the equipment of the plant. Ordinarily in changing stoves, one has to struggle



Universal Stove Burner Is Shown Moved Away from the Stove While the Latter Is on Air. To connect the burner the door to the stove is pushed aside on an overhead rack from which it is suspended, and the burner is moved back on the slide to proper position on the gas box



The Air Enters the Primary Valve at the Front and Passes Through a Central Chamber to the Mixing Chamber. The gas coming from the bottom passes through a jacket which is tapered toward the wall of the air chamber at its junction with the mixing chamber, thus producing a nozzle effect to draw in the required amount of air. The secondary air valve has been provided as a precautionary measure to provide a source of air if the gas pressure should fall temporarily to such a degree that the necessary suction would not be produced

with two heavy doors and, after opening them, to move back and forth two heavy chimney valves. The consequence is that it either takes a long time to change a stove or two men are required to do the work. With the Weinel chimney valve, a simple motion of a balanced lever either opens or closes the valve, thus materially reducing the time and effort required of the stove tender and making it possible to change the stoves much more quickly.

The stove foundations are of the skeletonized type. By suitable design and use of reinforcement, together with the provision of platforms about the stoves, cantilevered out from the foundation itself, the amount of concrete required was reduced 41 per cent. This design was not only in the interests of economy but was justified from the standpoint of appearance. Stove and furnace foundations are carried on McArthur reinforced concrete piling. The chimney for the stoves is of reinforced concrete design and is 225 ft. high.

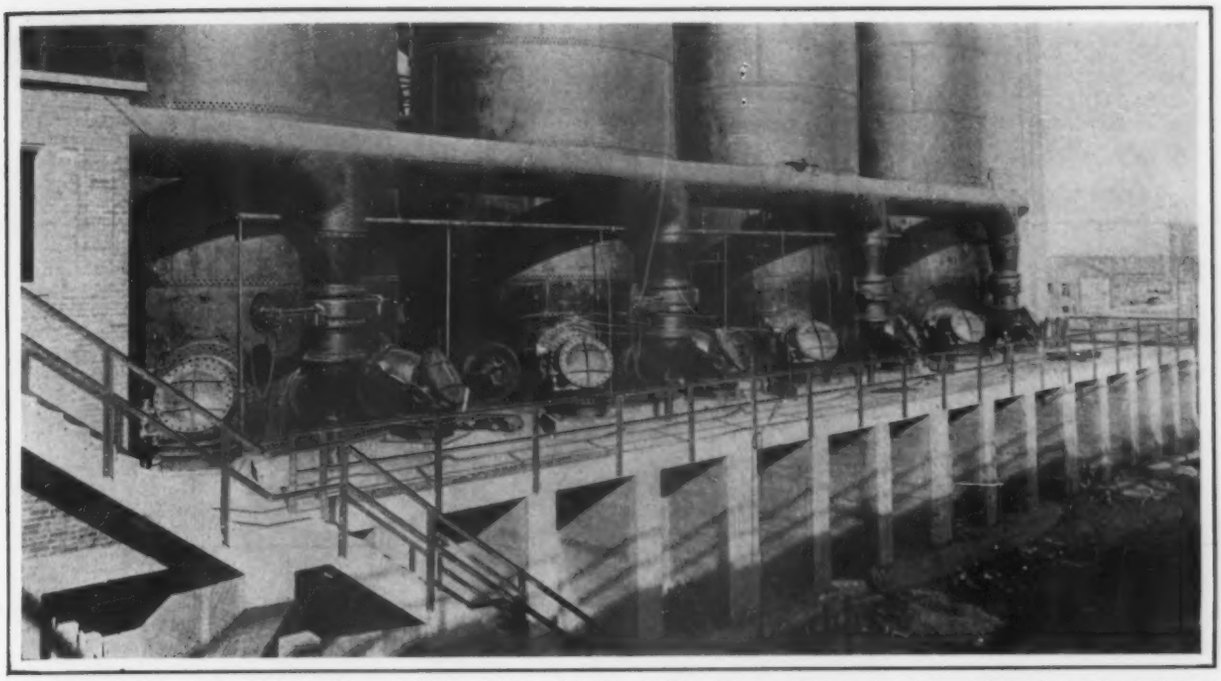
In the gas cleaning plant much attention was given to the recovery of dust from the gas, which, because of high ore costs, has assumed considerable importance in blast furnace operation. An 18-ft. dust catcher removes the rough dust, after which the gas passes through a 12½-ft. Brassert whirler, which removes the fine dust not settled out in the dust catcher. Ordinarily the dust catcher will remove about 75 per cent and the whirler close to 25 per cent of the recovered dry dust. From the whirler the gas is led through a water seal which serves to isolate the dry cleaning portion of the plant from the rest of the gas main system.

At this point the gas may be handled in several ways: that portion of the gas required at the stoves may be taken through the Brassert washer and dryer and the remaining part may be delivered to the boilers only dry cleaned. As an alternative both stoves and boilers may be furnished with washed gas, or if it proves necessary to repair the wet cleaning system, the dry cleaned gas may be sent both to the stoves and boilers, bypassing the wet cleaning plant entirely. A further means of recovering dust has been provided on the gas main leading from the cleaning plant to the boilers. The dust dropping from the gas collects in V-shaped legs and is dumped into a trough in which it is flushed to the base of the gas washer discharge.

The Brassert washer is of the same general type as is used at many other blast furnace plants. It embodies, however, developments in some details of construction that give a high degree of turbulent motion to spray and gas and insure precise water distribution. Measurable economy in the amount of water used and greater cleanliness of gas is obtained. The drier is of combined water seal-drier construction and is designed on the same principle embodied in the tangental dry whirler.

The stock bins are of Rawstorne reinforced concrete construction and not only are free from fixed charges for repairs and maintenance, such as painting and replacement of distorted and rusted members, but owing to the flexibility possible in concrete design, have lines which insure the free movement of materials. The approach to the bins is a combination of earth fill and trestle on a 2¼ per cent grade. The approach carries a single track, branching into two tracks on top of the bins, one of the tracks serving the coke, limestone and scrap bins and the other the ore bins. As an auxiliary to the ore bridge in handling ore and limestone from the yard to the bins, a Brown transfer car is provided on top of the bins. The car is of 50 tons capacity and is complete with air brakes, air-operated doors, etc.

To transfer coke from the coke plant to the coke bins, a standard 50-ton Atlas car is used. There is one 270-ton coke bin, connected by chutes direct with the skip hoist. There are four limestone bins of 200 tons capacity each, ten ore bins with 270 tons capacity each, and a 300-ton scrap bin.

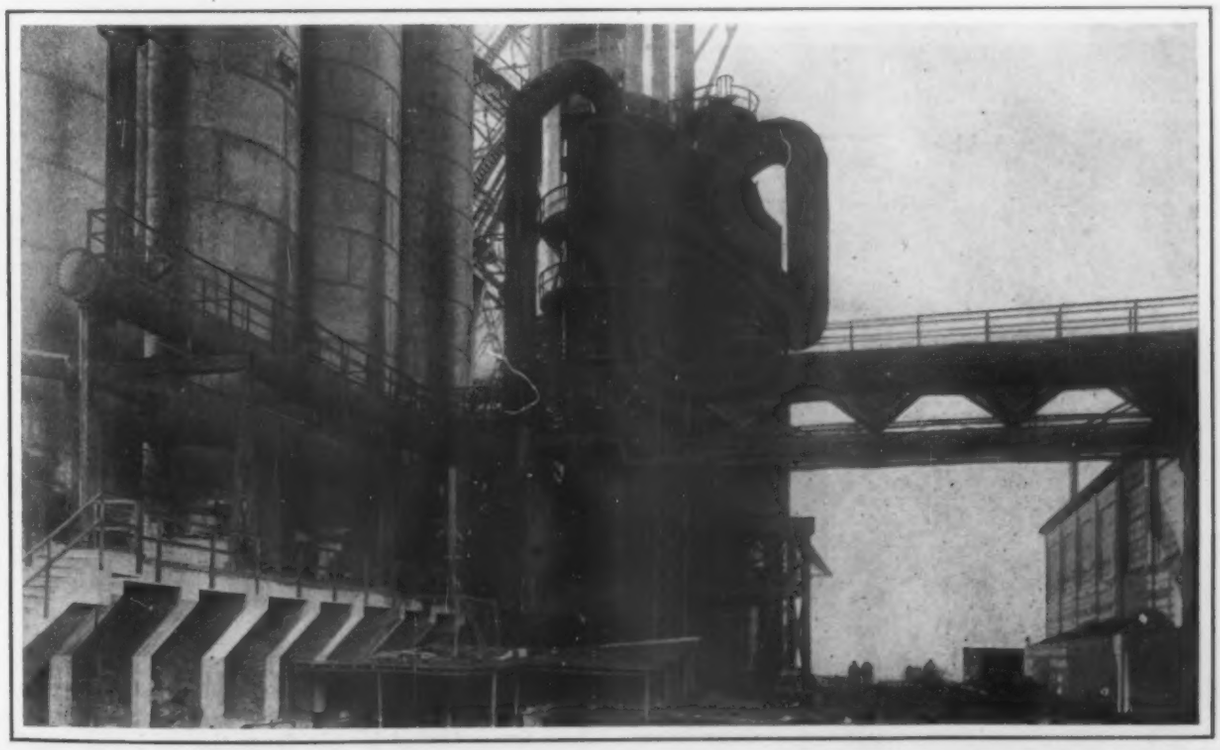


A Simple Motion of the Weinel Chimney Valve Balanced Lever Either Opens or Closes the Valve, Thus Materially Reducing the Time and Effort Ordinarily Required of the Stove Tender. The skeletonized concrete foundation under the stoves may be noted

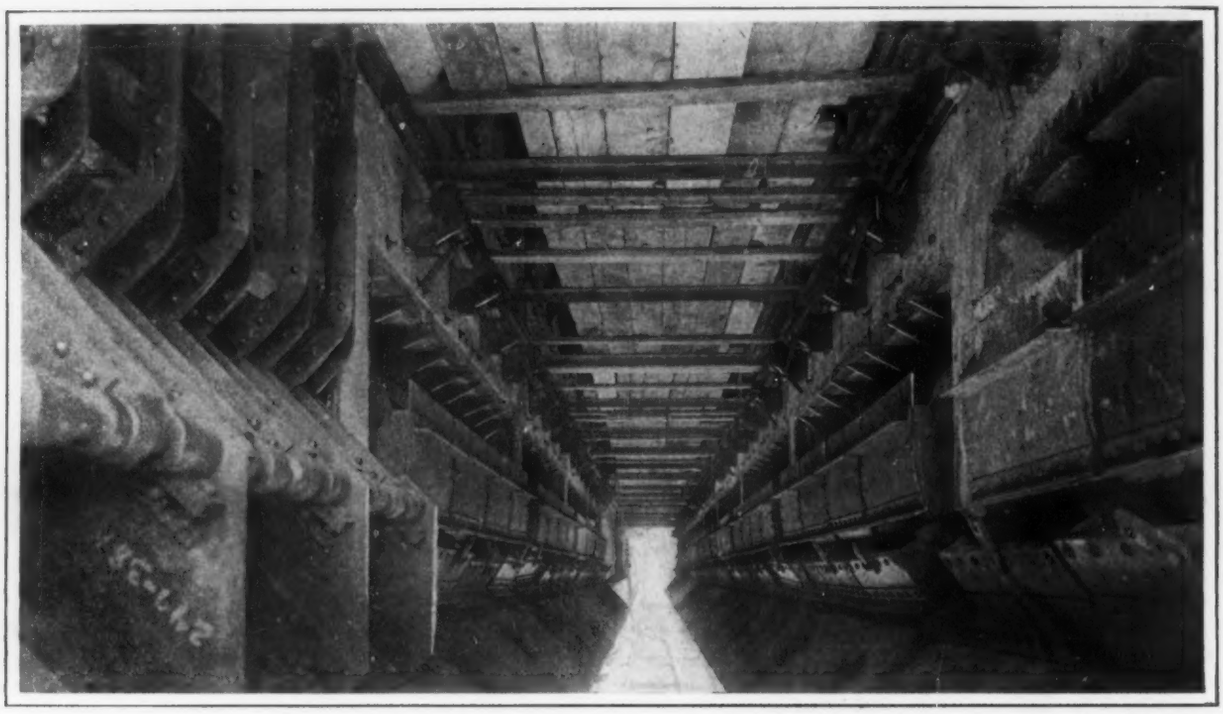
The coke is screened as it passes to the skip car by Haven type cascade screens. The slope of each element of the screen and the effective area of the screen opening may be altered to suit the character of the coke.

A track underneath the bins carries two standard electrically-driven Atlas scale cars which receive ore, limestone or scrap by gravity from the bins on either side above. Each car contains two hoppers of 130 cu. ft. capacity each and is equipped with air brakes, air-operated doors and a recording-type dial scale.

In contrast with the usual type of hand-operated gates, the ore bin gates are mechanically opened and closed. The new gates not only conserve labor but they are designed to avoid inaccurate weighing and particularly overweights, and to prevent the material from spilling and running through when the gates are being closed. The gate consists of two pivotally, radially mounted doors, spaced apart. The gate is so arranged that the movement of the outside door, to which a belt is attached for raising and lowering, opens and closes the inside door, thus opening and closing the chute leading from the ore bin. The belt passes over a pulley on a revolving shaft, but is normally held away from it by means of a spring-suspended sheave. To the end of the belt passing through the sheave is hung a rod, the position of which is such that it can be easily reached by the scale car operator when his car is in front of the bin. By pulling the belt into contact with the revolving pulley, the



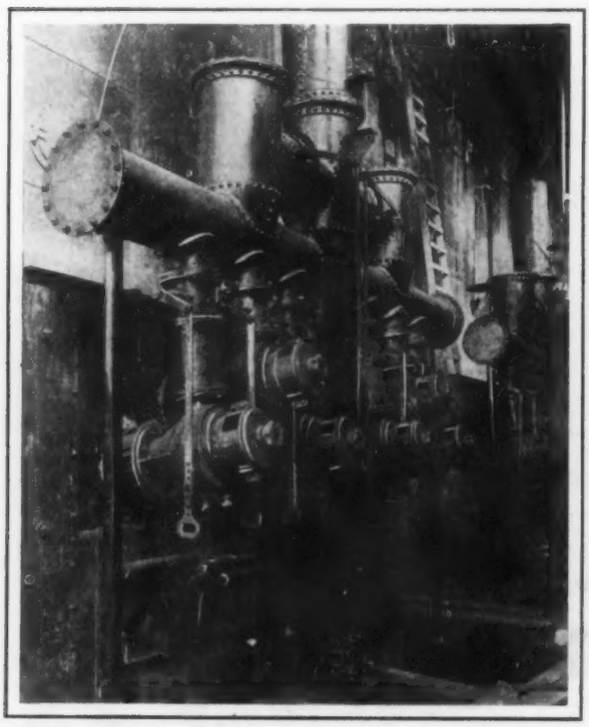
Under the Gas Main Leading to the Boiler House Are V-Shaped Legs in Which the Dust Drops in Transit. The dust is dumped from the legs into the trough below and is flushed to the base of the gas washer discharge



The Scale Car Operates on a Track Midway Between and Underneath the Stock Bins. The ore and limestone bins—on opposite sides of the track—are operated mechanically. The control levers to be noted just under the false floor are within easy reach of the scale car platform

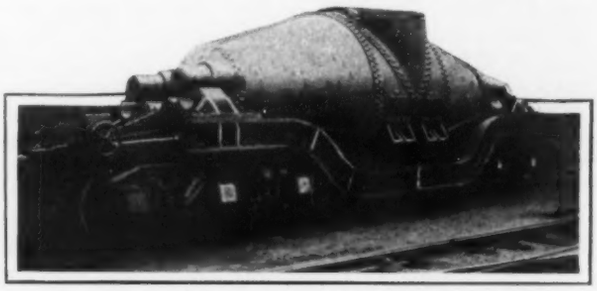
operator can raise and hold open the gate doors, whereas when he releases the tension they close by gravity. Patents covering the gates have been applied for by Freyn, Brassert & Co., Chicago.

The scale car operator performs other duties besides opening and closing the ore bin gates and weighing and discharging the ore into the skip cars. At appropriate intervals he moves his car to a platform above the skip hoist, on which appliances for operating the furnace bells, the test rods, the coke bin gates and the skip itself are mounted. Thus the employment of a separate operator to control the charging is unnecessary. The coke bin gates and the test rods are operated by compressed air.



The Heine Stirling-Type Boilers Are Equipped with Six Birkholz Gas Burners Each. The boilers are set with mud drums 10 ft. above the floor line

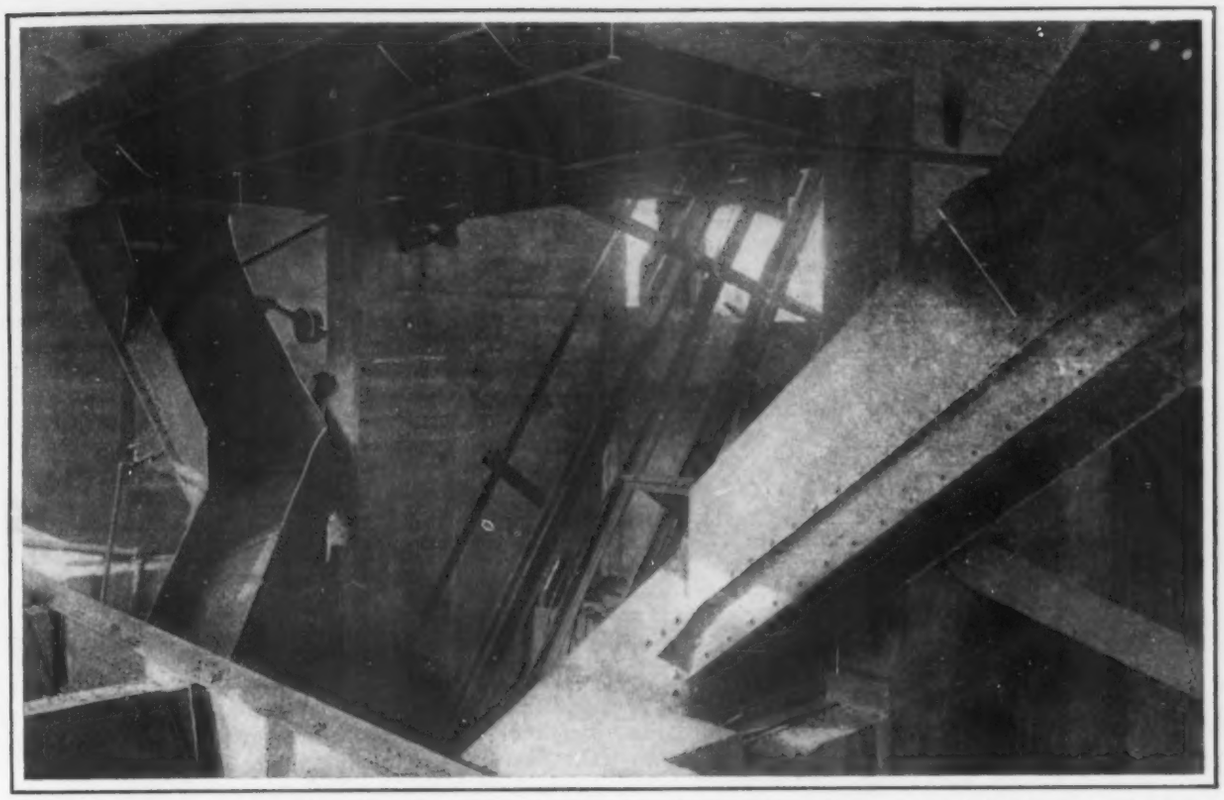
The bins are provided with a switchback track with a pit so that the extra scale car may be put aside for overhauling without interfering with



The Pugh Enclosed Type of Hot Metal Car Is Used Because of the Distance from the Blast Furnace to the Open Hearth Furnaces of the National Enameling & Stamping Co. The 70-ton ladle is mounted on two six-wheel trucks and is tilted by means of a motor on the ladle frame

other operations in the stock house. The bins contain about 3000 cu. yd. of concrete and 160 tons of reinforcing steel and are lined with cast-iron wearing plates.

The skip incline is of the standard Freyn-Brassert cantilever type, carrying two tracks equipped with skip cars having 4000 lb. coke capacity each. The skip incline is noteworthy because it was constructed so that none of its weight rests on the blast furnace shell. This prevents side thrust and any tendency toward pushing the shell out of plumb. The skip incline carries stairs of the interrupted flight type to the top of the furnace. The base of the steps leads both from the stock house bins and from the furnace cast house. In addition to the stairs running up the skip structure, flights have been provided from the cast house to the stoves, landing at No. 4 stove, the farthest from the furnace. In the skip house is a Lidgerwood single-drum skip hoist driven by a Westinghouse motor with Cutler-Hammer control. It is designed for an unbalanced load of 12,000 lb. and has a rope speed of 300 ft. per minute. In the skip house also are the cylinders operating the blast furnace bells. The cylinders are actuated by air from the cold blast main and an emergency air supply has been provided from a high pressure line.



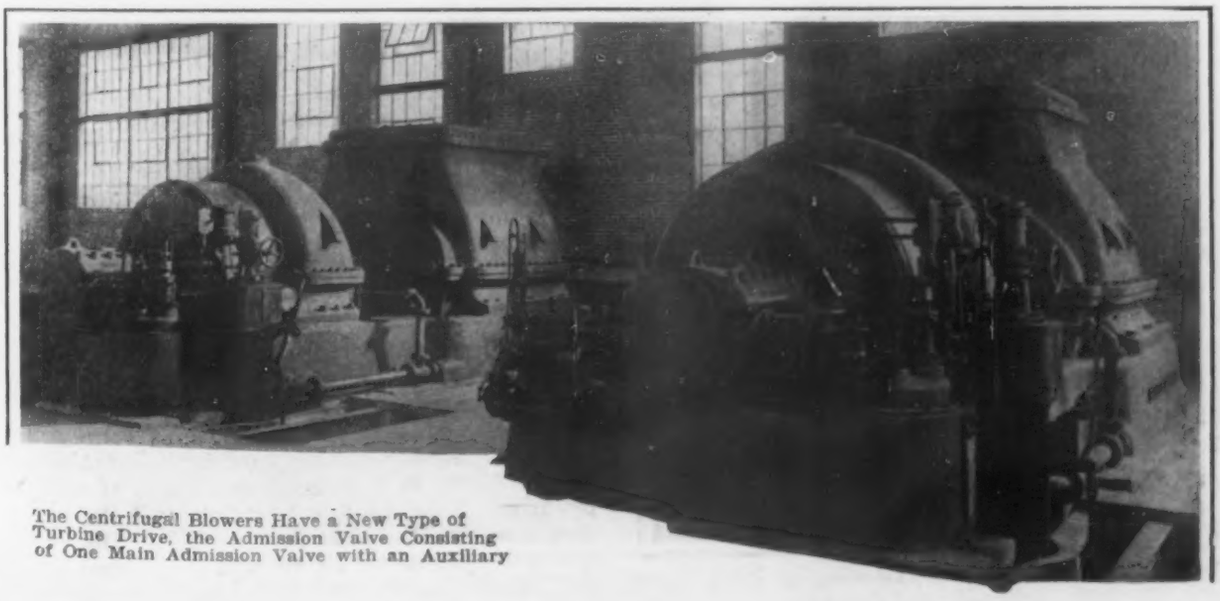
The Coke Passes Down Two Haven Type Screens to the Skip Car. At the extreme left may be noted the open track through which the scale car discharges the ore into the skip car. The platform partially obscured above is mounted with appliances for operating the coke bin gates, the furnace bells, the test rods, and the skip itself. These may be easily reached from the scale car

The ore yard adjacent to the stock house bins is 625 ft. in length by 275 ft. wide, and has a capacity of 200,000 tons of ore and 45,000 tons of limestone. On the side of the yard opposite the stock bins a McMyler-Interstate car dumper has been provided which has sufficient capacity to dump the largest cars in use to-day. The dumper discharges its contents into a McMyler-Interstate 100-ton transfer car which operates the length of the yard and drops its contents into a concrete trench, where the material is picked up by the ore bridge and distributed. The ore bridge is a McMyler-Interstate machine with a 275-ft. span, and is equipped with a 7½-ton bucket.

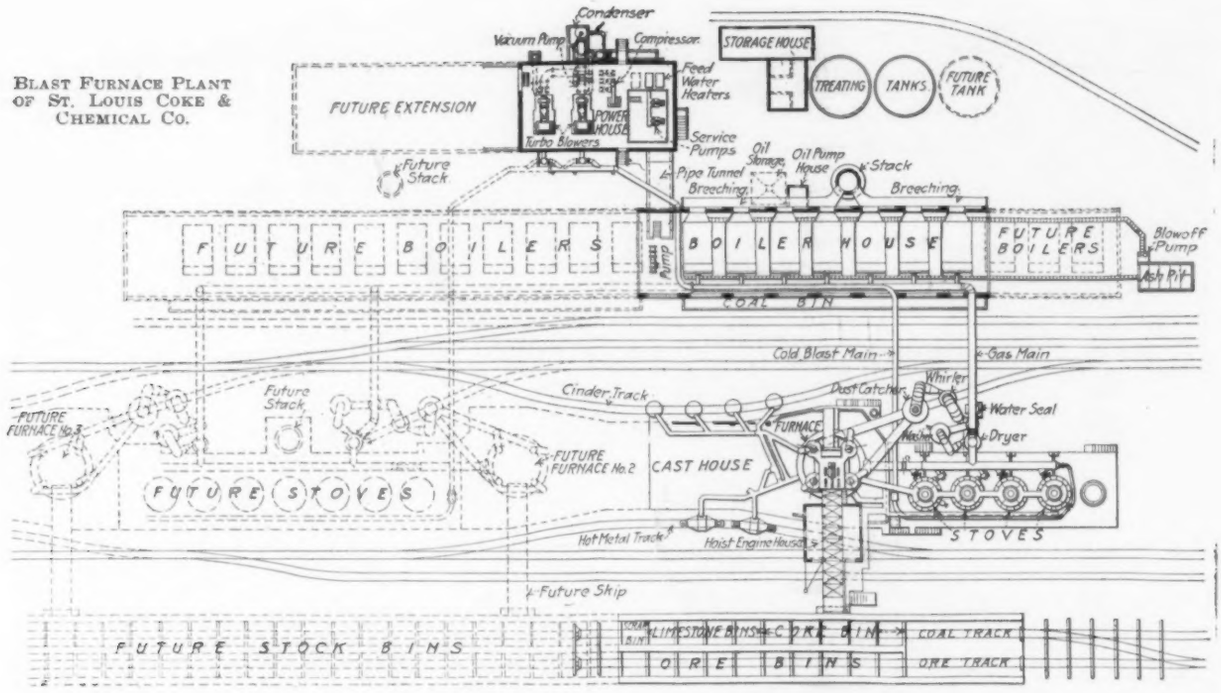
The blast furnace itself is 86 ft. in height and has a 20½-ft. bosh. Its capacity is 19,600 cu. ft., and it is rated at a daily production of 500 tons. It is lined with General Refractory Co. Olive-Hill fire brick. It has nine cast-iron columns and nine tuyeres. Its construction is in most respects standard, among its features being a cast-iron hearth cooling jacket with cooling pipe cast in, an armored tuyere breast and a heavily banded bosh. The blast furnace top was so designed that easy access is afforded to all sheaves, bell rods, bell beams, hoppers, etc. It is equipped with a McKee revolving distributer of the six-station, six-cycle type and has four uptakes of standard Freyn-Brassert construction provided with Baer explosion valves, each uptake leading to a downtake and thence into downcomers leading to the dust catchers.

Enclosed Type of Hot Metal Car

The blast furnace will be used principally to furnish hot metal for the open-hearth furnaces of the National Enameling & Stamping Co., which are



The Centrifugal Blowers Have a New Type of Turbine Drive, the Admission Valve Consisting of One Main Admission Valve with an Auxiliary



a distance of 7000 ft. away. As the open hearths are not served by a pig iron mixer, it proved necessary to provide hot metal cars which would hold the heat in the iron. It was recognized that occasionally the metal would be detained in the ladles for a considerable length of time before use in the open hearths and therefore a container which would prevent skulling had to be supplied.

Accordingly, four Pugh 70-ton hot metal cars, manufactured by the M. H. Treadwell Co., New York, were provided. This car is of an enclosed type, mounted on two heavy six-wheel trucks and equipped with air brakes and all standard Interstate car appliances. The ladle is tilted on the trucks by means of a motor mounted on the ladle frame. The fact that the rail line connecting the two plants passes through a populated section, crossing some street car tracks, also dictated the use of an enclosed type of car which would prevent the spilling of the metal.

The St. Louis Coke & Chemical Co. anticipates that some surplus pig iron will be made which can be offered for general sale. This will be available from a pig casting machine. The machine is located 1000 ft. beyond the blast furnace to permit the later construction of two additional furnaces, the first of which will join the present unit, cast house to cast house. The machine is of the double-strand Pittsburgh Coal Washer Co. design, and is mounted on a Green type reinforced concrete structure. This type of construction was chosen because it prevents the costly deterioration encountered with structural steel resulting from corrosion by the steam generated during operation. A further advantage of the concrete structure is that it provides a continuous platform under the strands, thereby facilitating the replacement of moulds and providing a continuous channel for the spray water which is carried into a sump at the pouring end instead of scattering all over the ground underneath the machine. The length of the rails carrying the machine was limited to 11 ft., this being a convenient length to handle when replacements are necessary. A unique and valuable feature of the construction of the machine is that all molds can be replaced by open sand castings poured at the plant.

A combined ladle and pouring house is situated at the end of the machine. A railroad track runs through the house and a stub track has been pro-

A McMyler-Interstate 100-Ton Transfer Car Drops Ore and Limestone into a Concrete Pit from Which They Are Picked Up by the Ore Bridge and Distributed

vided within the structure for ladle cleaning and relining. When starting the pig machine, a ladle car is switched in to the end of strands. It is to be noted that no crane is required to pour the ladles as tilting is accomplished by a motor carried integral with the car. The ladle in use, of 70 tons capacity, will pour its contents into the machine molds in 35 min. Ladles are weighed in a scale house containing a 200-ton Strait track scale, located about midway between the blast furnace and the casting machine.

For the disposal of cinder there are five Pollock 315-cu. ft. cinder pots, for which four Pollock cinder pot railroad trucks have been provided. About forty acres is available close at hand for the disposal of slag, and here the pots are mechanically dumped.

A notable deviation from common practice is to be found in the boiler house. Here are housed seven 800-hp. gas burning boilers, which were furnished by the Heine Safety Boiler Co., St. Louis. They are of the Stirling type, but have an unusually high setting to secure high rating and overload. In boiler operation, when the burner is located relatively close to the water tubes, the flame is cut short when it strikes the water tubes. To overcome that condition the boilers in use at the St. Louis Coke & Chemical Co. plant were set with the mud drums 10 ft. above the floor line, and hence the combustion chamber between the setting of the boiler and the tubes was expanded to permit the flames from the burners to take a long swing upward without impinging on the water tubes. Baffles are placed in such a manner as to help in securing a good radiation effect.

Each of the seven boilers is equipped with six Birkholz gas burners with appliances for regulating the flow of gas to accommodate the load. They also have Foster superheaters, supplied by the Power Specialty Co., Vulcan soot blowers, Kelly grates and American Steam Corporation ash ejectors. Three of the boilers are equipped with Schutte-Koerting oil burners for emergency firing. The oil burners are located on the side of the setting opposite the gas burners. They burn in an auxiliary combustion chamber, placed under the mud drum. This chamber is connected with the blast furnace gas combustion chamber, thus securing much the same radiation effect as when the boilers are working on gas.

The Heine boilers not only supply the steam required at the blast furnace plant for blowing, pumping and miscellaneous purposes, but also furnish from 1400 to 1800 boiler horsepower for use at the coke oven plant. They are designed for 225 lb. pressure and 125 deg. Fahr. superheat. A common draft flue and a single reinforced concrete stack, 225 ft. high, serve the boilers.

A tunnel connecting the sub-cellar of the boiler house with the cellar of the power house adjacent, contains all service water, high pressure water and boiler feed water lines, as well as compressed air and steam lines and conduits.

The power house has an open basement in which are located two Cameron 3000-gal. capacity Terry turbine-driven pumps, which pump the tail water from the condenser to the washer, the pig machine, the water softener, etc. There are also three Cameron 350-gal. Terry turbine-driven boiler feed pumps. Room has been provided for the installation of additional pumps to take care of the two additional blast furnaces, when they are built. The pumps can all be reached by the overhead crane in the power house. The basement is notable for its lighting, for the working room provided about steam and water pipes, and for the overhead clearance under the air intake and discharge lines of the blowers and under the exhaust lines to the condenser.

New Design of Turbine Drive for Blowers

On the operating floor of the power house are two Ingersoll-Rand centrifugal blowers, which incorporate a new design of turbine drive in that the steam admission valve consists of one main admission valve together with an auxiliary. On the test block marked economy was shown in the consumption of steam, together with a very sensitive response to variations in pressure and volume of wind. The blowers have 45,000 cu. ft. maximum capacity at 25 lb. pressure.

Connected with the two blowers is an Ingersoll-Rand-Beyer trype condenser capable of maintaining a 28-in. vacuum. On the operating floor, also, are an Ingersoll-Rand double dry air pump, a Worthington air compressor of 350 cu. ft. capacity at 100 lb. pressure, and a double Blake-Knowles 4000-hp. feed water heater.

The power house is served by a 10-ton motor-driven traveling crane. The building is exceptionally well lighted. The operating floor is entirely free from steam and air piping; all the connections to the turboblowers, air compressor, air pump, etc., are carried in the basement.

One of the features of the power house is the fact that the air intake was carried to a considerable height above the roof, this being done to prevent drawing in dust rising from the yard and to obtain air which is less subject to variations in temperature and moisture than is the case when it is taken from a point closer to the ground.

The large water reservoir which serves the plant is of novel design. Water is drawn by motor-driven pumps from wells 80 ft. deep. From the deep well pumps the water is delivered into a double-compartment concrete reservoir, so arranged that the water flows directly from the discharge of the well pumps across the reservoir to the primary pumps. Any temporary deficiency or surplus between the capacity of the deep well pumps and the primary pumps is wiped out by an equalizing flow of water into or out of the reservoir compartments on either side of the canal which connects the deep well pump discharge with the intake of the primary pumps. The two reservoir compartments, each of 1,000,000-gal. capacity, are so arranged that one or the other may be isolated for cleaning, as it is anticipated that the silt carried by the well water will make an occasional cleaning out necessary. From the reservoir, water is pumped by means of three Cameron 3000-gal. capacity motor-driven pumps to the coke ovens and blast furnace. Floating on the water lines to furnace and coke ovens is a 20,000-gal. standpipe.

Provision has been made for conservation in the use of water. In supplying the furnace plant, the pumps discharge directly to the blast furnace bosh, after which the water returns by gravity and feeds the condenser. Any deficiency at the condenser is supplied by the primary pumps. From the condenser hot well, 95 deg. Fahr. water is repumped by the pumps in the power house basement to the gas washer, the pig machine, the ladle house and miscellaneous wash-up lines, and to the feed water treating plant. The economy effected in the use of water through this system is evident. The primary pumps also furnish 4,000,000 gal. of water a day to the coke ovens. The boiler feed

(*Continued on page* 105)

Rolling of Variable Section Steel Bars

Continuous Die Forming Process of the Witherow Steel Co.—Built-up Rolls Allow Diameter Loss to Be Adjusted

BY G. R. NORTON*

THE principles of rolling steel bar material into sections of variable area, developed during the war, as instanced by the making of stream line wire for airplanes, have been applied to peace time production by the Witherow Steel Co., Pittsburgh, which now makes deformed bars, tie rods, automobile axles and shafts, etc. The process has been called "continuous die forming," the complete conversion of shape being accomplished in one heat. The rolls are in segments, which when assembled upon mandrel form segmental rings. Because of this construction the loss in diameter through wear and dressing are quickly, easily and repeatedly remedied.

From the inception of the practice of forming heated metals between rolls into the various bars and shapes, commercially known as rolled products, the improvements on the original process have been along the lines of increasing production by the introduction of mechanical handling devices, increased power and speed and more durable materials for rolls. The character of the product of the mill is essentially the same, being for the most part bars or shapes of constant area and form of section.

By the use of tapering and so-called forging rolls, materials have been formed possessing variable cross sectional areas, such as pipe wrench handles and rifle barrels. Certain mills also roll clip and strap shapes in which rounds, ovals or squares alternate with flats, half ovals or other sections by flattening or otherwise changing the form of the alternating round, oval or square.

Such shapes being rolled between the surfaces of two rolls, in one of which an impression has been cut without a corresponding impression in its mate, are never symmetrical about their longitudinal axes, and the round sections are usually somewhat flattened on the side opposite the impression in the forming roll. As such rolls wear in operation, their diameters become smaller, shortening the circumferential lengths of the impressions and reducing the longitudinal dimensions of the alternating round and flat on other sectional forms, and at the same time increasing the cross sectional area and changing its shape. A new impression must then be cut on the original diameter of the roll to produce shapes of specified forms and lengths. This process is necessarily limited in the character of its product.

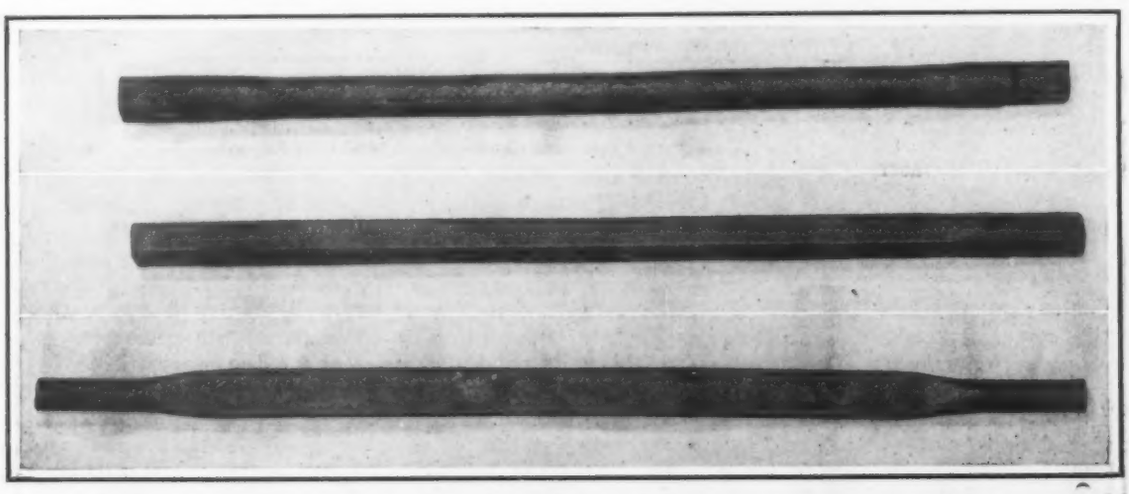
*Steel works manager Witherow Steel Co., Pittsburgh.

Stream Line Wire Designed

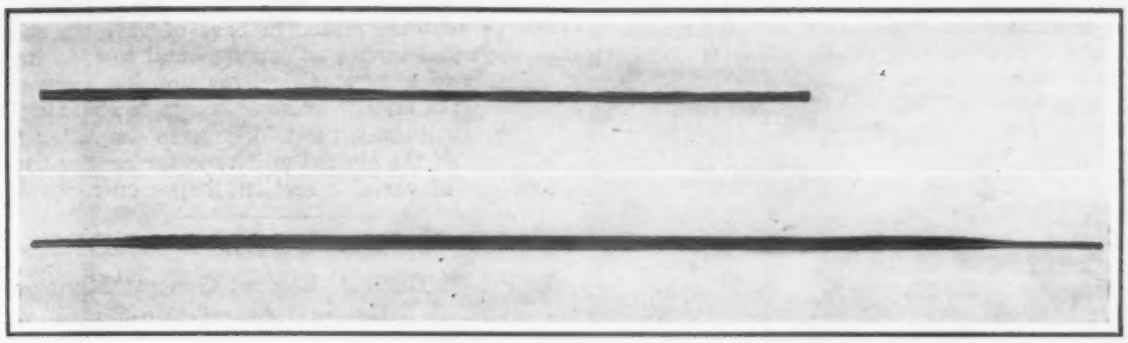
During the war it was found that the stranded cables used as ties between the planes of aircraft offered an appreciable wind resistance and by vibration cut down the speed of the machines. It was desired to replace the cables with some member of the structure which would offer a minimum of wind resistance and be practically free from vibration. For this purpose stream line wire was designed, having an extremely flat oval body with cylindrical terminals at each end by which connections were made to other members of the plane's structure. The cross sectional area of the body of the wire was about 25 per cent less than that of the terminals, and all parts of the wire were on a common axis and symmetrical about it. Each wire was to be made from one piece of steel without welding or upsetting.

Stream line wire was produced by cold rolling from a round bar to the flat oval body and by swaging, but as neither process was entirely satisfactory as to quality and quantity the problem of forming this bar with its varying sections was attacked by the Witherow Steel Co. and, after a very considerable amount of research and experimental work, was solved, so that stream line wire in various sizes and lengths was produced in quantity by rolling in one heat.

In order to make the production of variable section bars possible on a commercial basis, the solution of three distinct problems was necessary and these were: (a) That to roll several sections symmetrical about a common axis in one bar, an impression must be formed in the surfaces of *both* rolls between which the bar is formed and that the two impressions must match exactly during the entire pass; (b) that in order to produce work within the very close limits specified, some type of roll



In the Top Two Products Round Cross Sections Alternate with Square; in the Bottom, Round with Flat. From top to bottom these are: A rear axle shaft, an axle and a tie rod



Top: Deformed Reinforcing Bar. Bottom: Stream Line Wire, the Original Product

which would permit frequent dressing must be used, and that the loss by wear and dressing in the diameter of the roll must be compensated; (c) that some method must be provided of entering the pass so that the end of the leader would meet the end of the impression and avoid the production of partial lengths involving a high proportion of scrap.

The exact matching of the impressions in the opposing rolls was effected by supporting them in extremely rigid and heavy housings of sufficient height to permit the use of rolls from 18 in. to 68 in. in diameter which were made to rotate in any desired relation to each other by a train of adjustable gears mounted on one of the housings. Top and bottom screws give vertical movement to the rolls and micrometer adjustment is provided by a vernier dial which indicates the spacing of the rolls. As only one pass is made through the forming rolls, their faces are narrow and the distance between housings small so the spring of the rolls under pressure is negligible and the size of the pass may be regulated with a high degree of accuracy.

After making provision for the exact matching of the impressions, a design of rolls was considered which would satisfy the given conditions of facility in dressing and means of compensating for the inevitable loss in diameter suffered through wear and dressing.

It is obvious that a solid roll cannot be made to meet such requirements, so a built-up construction was adopted in which the active faces of the rolls were made of hardened steel segments in which the impressions were cut, the ring formed by the assembled segments being carried on the body of a mandrel which was grooved in its periphery to provide a seat for the inside of the segmental ring, and equipped with devices for locking the segments in position. The ends of the mandrels are formed into necks which serve as journals and to carry the matching and driving gears.

Roll May Be Expanded to Original Diameter

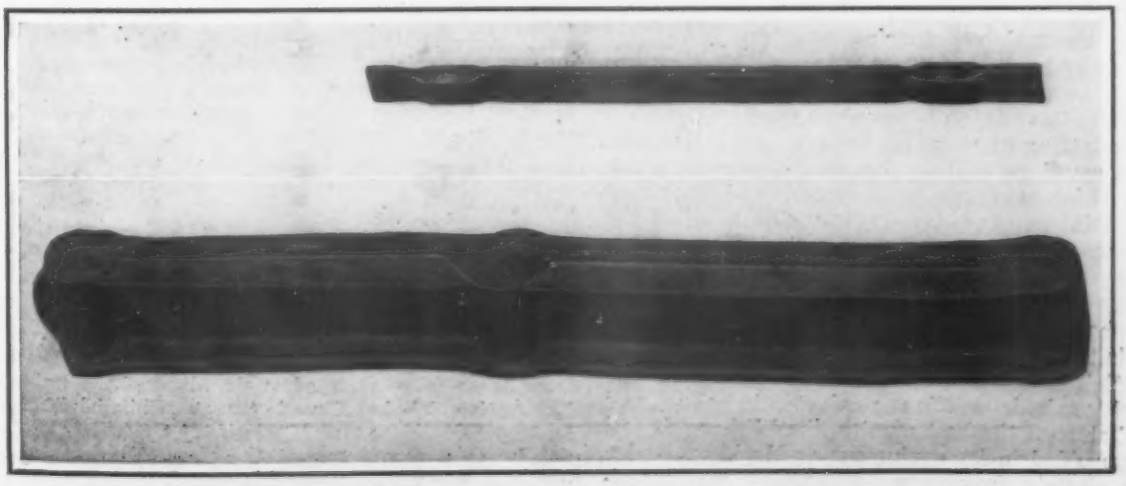
This design adequately serves to meet the requirements of ease in dressing impressions and as compensation for losses in diameter, as the built up segmental ring may be expanded to its original diameter with a small expenditure of time, labor and material, while an almost indefinite number of dressings is possible.

To properly enter the pass so the entering end of the leader will be engaged in the end of the impression in the rolls, an electrically operated gate or stop is synchronized with the end of the impression, so that when this point on the rolls arrives in its rotation in the proper position the gate is released and the leader entered.

After the armistice the manufacture of stream line wire was discontinued but the segmental rolls were employed in the production of a strictly tonnage commodity—deformed reinforcing bars—and their performance on many thousand tons of this material fully justified the confidence of the designers.

The roll matching gear train, segmental roll construction and automatic entering gate were the inventions of George Baehr, general superintendent Neville Island mill, while the development of the process and its present commercial establishment is due to the efforts of W. P. Witherow, president of the company. The features of design and their application to rolling mills have been fully covered by basic patents in the United States and other countries.

The Witherow Steel Co. operates its plant on Neville Island, (Pittsburgh district), its equipment consisting of 12 stands, 14 in. rolls and 5 stands, 9 in. rolls, and in addition to these roll trains the



More Complicated Designs: Top, Flat Bar with Bosses. Bottom, Section of Automobile Front Axle

specially designed stand originally built for the rolling of stream line wire. The finishing stands of the 9 in. and 14 in. mills are equipped with matching gears and mandrels so that suitable leaders are rolled from billets on the roughing and strand rolls and formed into variable section shapes in the final pass on the finishing stands without reheating. Leaders for the special mill are rolled on either the 9 in. or 14 in. mills, and finished in the same heat.

In cases where variable section material is required in lengths less than the circumference of the smallest roll possible to operate in the 9 in. mill, multiple impressions are cut in the rolls and two or more pieces, gated together and to those following, are produced at each revolution of the rolls. Lengths up to about 17 ft. can be rolled on the special mill when equipped with the maximum size rolls.

Reductions in sectional area, both with and without a change in sectional form, have been accomplished, and as each variation in section presents its individual problem, it is impossible to predict exactly the limitations of the process.

The accompanying illustrations will convey an idea of the character of work produced and the possibilities of "continuous die forming" as this method of manufacturing has been termed. It will also be apparent that it is essentially a process requiring quantity production for economy of operation.

The action of rolls upon heated metal is analogous in results to drawing under the hammer except that the former is continuous and faster. In variable section rolling, reductions in area between the extremities of a bar may be made in one operation and heat, eliminating drawing in the center or upsetting the ends, and in this its relation to the drop forge industry is apparent.

Many forgings require a considerable number of blows under the hammer to produce a blank which can be struck in the finishing impression to produce the ultimate form of the forging. Such blanks by reason of the character of the work frequently contain a large amount of metal in excess of the weight of the finished piece, this excess appearing as flash and tongholds, so that it is not unusual for one pound of finished forging to require from two to three pounds of stock for its manufacture. This is no inconsiderable item in cost when freight and handling charges are considered in addition to the cost of the stock itself, particularly in the use of high priced alloy and special steels.

Continuous Die Forming Prevents Wastage

By continuous die forming, convenient lengths of multiple blanks can be rolled, closely approximating the finished forging weights and these blanks may be struck directly in the finishing impression in the die with but little wastage of stock or struck after edging if the piece requires bending.

The cutting of roughing impressions in the dies is thus saved as well as the time of the roughing blows, which are likely to be more than 50 per cent of the total number struck. It makes possible the use of smaller die blocks by the elimination of impressions. It cannot be claimed that blanks for all forgings can be manufactured by this process, as many shapes required for the purpose would be impossible to roll.

Anticipating a demand for continuous die formed variable section products in alloy and special steel of the best quality, the Witherow Steel Co. has added to its equipment at Neville Island a 10-ton electric furnace with chemical and metallurgical laboratories, and steels made in this unit can be supplied either in bars of variable section or the usual shapes as supplemental to open hearth carbon and alloy steels. Provision has been made in the plant layout for additions to the melting and rolling equipment, the additions to the latter to be in units of the special mill type for continuous die forming of variable section shapes only.

MACHINE TOOL BUILDERS

Ernest F. DuBrul, Elected General Manager of National Association

Ernest F. DuBrul has been elected general manager of the National Machine Tool Builders' Association, and for the present the headquarters of the association will be at Rooms 817 and 818 Provident Bank Building, Cincinnati. He will take on the active work on Jan. 1, 1921.

E. F. DUBRUL

Mr. DuBrul was born at Cincinnati in 1873, and received his college education at the Notre Dame University, graduating later in economics at Johns Hopkins University. His business experience was as secretary, vice-president and later president of the Miller, DuBrul & Peters Mfg. Co., maker of cigarette machinery, and also as president of the Pyro Clay Products Co., manufacturer of firebrick. In civic and association work Mr. DuBrul has been very active, having served on the boards of the Ohio Mechanics Institute, University of Cincinnati and the Cincinnati Business Men's Club. He has also been active on committees of the Cincinnati Chamber of Commerce, National Association of Manufacturers and the Refractories Manufacturers' Association. During the war he was engaged in all of the Liberty Loan and Red Cross campaigns and had supervision of the Southern Ohio district for the training service of the Department of Labor.

For quite a number of years Mr. DuBrul was also the commissioner of the National Metal Trades Association. He is an associate member of the American Society of Mechanical Engineers. He has traveled extensively throughout quite a portion of the world and is a student of questions which relate to the development of modern day business.

Motor Cylinder Iron from Electric Furnace

The Electric Furnace Construction Co., Philadelphia, announces the starting up of a Greaves-Etchells electric furnace at the Holmes Foundry Co.'s plant, Port Huron, Mich., for refining and superheating molten cupola metal. Results obtained have been satisfactory and encouraging. It has been found possible, by short treatment in this electric furnace, to increase the fluidity of the metal and to largely eliminate sulphur. The cupola iron contained 0.012 per cent average sulphur, and the finished product showed only 0.023 per cent sulphur. Time taken was about 40 minutes.

Charges of cold scrap have also been run, consisting of 80 per cent cylinder scrap and 20 per cent iron borings. Sulphur in final product from the cold melted heat was reduced to 0.013 per cent.

During the past year, 1920, a total of 1545 locomotives has been constructed at the plant of the Baldwin Locomotive Works, Broad Street, Philadelphia, as against 1098 in 1919, and 3348 in 1918. The last year noted was a record one at the plant, which was engaged in war work during this period.

Large Steel Output Under Handicap

(*Continued from page 3*)

siderable tonnage on its books at the March 21 prices suggests that it might tolerate for some time slight variations by its competitors; but with capacity in excess of demand it is evident that competitive conditions will be the maker of steel prices in 1921.

Steel Corporation Suit and Pittsburgh Basing

March 1, 1920, was made an outstanding date in the year for the steel industry by the decision of the Supreme Court of the United States in the Steel Corporation dissolution suit. The court held that the United States Steel Corporation does not constitute a trust in violation of the Sherman act. The decision was by a four to three vote, with two justices not participating. The court affirmed the unanimous decision of the New Jersey District Court, made prior to the war and thus put an end to the efforts of the Government to dissolve the Steel Corporation. The decision provided that the Government would be in position to begin new proceedings only in the event that specific violations of law occur in the future.

Another important decision of the year was that of the Federal Trade Commission that the maintenance of the Pittsburgh basing system for fixing steel prices is not in violation of the Clayton anti-trust act and is not an unfair method of competition under the terms of the Federal Trade Commission act. Late in July by a three to two vote the commission dismissed the application of the Western Association of Rolled Steel Consumers for the issuance of a formal complaint against the United States Steel Corporation and other steel companies. The case had been before the commission for more than a year. In the latter part of September, by a vote of four to one, on representations of the Western Association of Rolled Steel Consumers, the Federal Trade Commission reopened the case. Arguments were made in November, by attorneys for the associated consumers and on the other hand by representatives of the Steel Corporation and various independent steel companies. In these extended arguments the method of quoting steel prices f.o.b. Pittsburgh was referred to as the "Pittsburgh Plus" system. The arguments were finished on Dec. 9 and a decision is expected in February.

Coke Scarcity

The end of Government control of fuel prices came on April 1 and within a week coke had jumped from $6 per ton at oven to $10 per ton. Profiteering in coal and coke was notorious, and blast furnace companies which had bought coke on contract found it impossible to get full shipments, as the prices for spot coke continued to rise. For six months exorbitant prices were charged—$18 being paid by a good many furnaces for prompt coke in August and September—and high fuel cost led to mounting prices for pig iron. The contrary movement was rapid enough when the market turned in late September, and the year ended with prompt coke available at $5.50 at oven.

Export Trade

Export shipments of iron and steel for the first 11 months of 1920 show an increase of 199,233 gross tons over the same period in 1919. To Nov. 30, 1920, 4,402,056 gross tons was shipped, against 4,202,823 tons to Nov. 30, 1919. The total value of all iron and steel products (including machinery) exported to Nov. 30 was $990,044,873, against an aggregate of $908,127,729 in the 11 months of 1919. To these amounts must be added the values of various products, such as railroad cars, automobiles and agricultural implements, into which iron and steel enter.

Iron and steel imports showed another increase over the previous year's tonnage, although not as great as the 1919 increase over 1918. While the 438,242 gross tons imported in the first 11 months of this year was about 55 per cent greater than the 282,465 tons for the like period of 1919, the latter figure was 87 per cent greater than that for the first 11 months of 1918, which, however, was a war year.

Export trade faced many handicaps in 1920—the Japanese depression, rail congestion caused by the railroad switchmen's strike, the reappearance of German and Belgian competition, the drop in South American exchange rates, the moratorium in Cuba, and a declining world demand for iron and steel toward the end of the year. The table below shows how export shipments of products, stated in the statistics in tons, compared with previous years:

Exports of Iron and Steel, Gross Tons

	1917	1918	1919	1920
January	608,286	495,345	360,456	333,601
February	449,104	440,532	234,793	308,185
March	606,560	382,195	344,506	417,216
April	521,176	465,865	408,204	395,120
May	587,900	493,241	447,050	420,359
June	631,712	421,963	544,580	402,707
July	349,649	457,233	287,823	458,866
August	522,810	511,858	396,743	431,484
September	489,415	473,066	363,505	409,200
October	571,893	388,777	302,456	452,015
November	473,929	448,716	295,045	434,297
December	656,044	357,703	254,676	.....
	6,468,478	5,336,494	4,239,837	4,800,000*

*Estimated.

Labor Phases

Labor conditions at the beginning and the end of the paper were in marked contrast. In the early months labor scarcity was marked. The Steel Corporation advanced wages 10 per cent on Feb. 1, this being the ninth advance since Jan. 1, 1916. Other producers followed. The Steel Corporation's payroll in 1918 was $452,663,000, and was said to be more in 1919. Chairman Gary, in a statement issued late in November, said that $51,000,000 a year had been added to the corporation's payroll since March 21, 1919, when the Industrial Board prices of steel were announced. The Frick Coke Co. made a wage advance effective April 1 amounting to 10 to 13 per cent.

In December, when the operations at independent steel plants had fallen to a low rate, several companies announced wage reductions effective Jan. 1. These amounted in some cases to 20 and 25 per cent. The Steel Corporation, it was generally understood, had no plans for wage reductions and would make none as long as its shipments were of product sold on the March 21, 1919, basis. From time to time in the year announcement was made of the plans of the American Federation of Labor for a new campaign to organize the steel works employees of the country. The committee in charge of this work, it was reported, was headed by M. F. Tighe, president of the Amalgamated Association of Iron, Steel and Tin Workers. The statement was definitely made that W. Z. Foster and John Fitzpatrick, who were in charge of the strike of 1919, would not take part in any new effort to unionize the steel workers of the country.

While common labor in the steel and metal-working industries was scarce for the greater part of the year, there were evidences as early as June that in some lines efforts were being made by employers to increase per capita output. In the Chicago district, for example, in a number of metal-working shops slight reductions in working forces were made without a proportionate decrease in output. Reports have come from an increasing number of establishments whose forces had been diminished from 10 to 20 per cent without reduction in total output. Employment in the automobile industry steadily decreased from early June.

In a few cases steel plants were operated a part of the year on the three-shift plan, doing away with the 12-hour turn. The Inland Steel Co., which went to

the 8-hour turn in 1919, announced in December, 1920, that it would go back to two turns of 12 hours each in continuous operations. A number of steel companies, in view of the sharp falling off in orders, arranged hours so as to eliminate overtime.

Earnings

What has been said above concerning demand and prices has indicated rightly that earnings of all steel companies were better in 1920 that in 1919. There was by no means the yield of excess profits subject to heavy Federal taxation that had marked war years, costs being higher than in war years and, in the case of the Steel Corporation prices being lower than in war time. The Steel Corporation's net earnings for the first nine months of 1920 were $133,296,264, as against $108,-021,917 in the first three quarters of 1919. The independent companies made quite diverse showings. The Lackawanna Steel Co.'s statements for the first three quarters showed profit, after all deductions for interest on bonds, depreciation, etc., of $4,714,370, against $1,317,350 in the corresponding nine months of 1919. The Republic Iron & Steel Co.'s nine months' showing was $8,043,719 against $2,836,019 in the first nine months of 1919. That of the Midvale Steel & Ordnance Co. was $17,146,523, against $13,691,754.

Labor Troubles Cause Congestion

Strikes of Coal Miners and Railroad Employees Result in Much Delay in Deliveries

LABOR troubles in other industries, notably in the coal mines and among some of the employees of the railroads, disturbed the iron industry to a much greater extent than did any troubles within that industry, whose employees seemed to have learned the lesson of the disastrous strike of 1919, and were not willing to be again led to defeat by radicals bent on "boring from within" or by any other agitators.

While possibly there was not the efficiency among the iron and steel plant workmen during the year just closed that might have been expected from the fact that wages were at the highest notch in the history of the industry, as a 10 per cent increase made on Feb. 1, 1920, by the United States Steel Corporation was followed by other iron and steel producers, especially in those districts where there are plants of that company, it must be said in all fairness that production suffered less from this cause than from the fact that fuel was extremely hard to obtain during the greater part of the first half of the year and when the situation began to improve in this respect, it received a fresh set-back from the outlaw strike of the railroad switchmen and yard crews.

Orders of Interstate Commerce Commission

The effect of this trouble hardly had begun to wear away when orders issued by the Interstate Commerce Commission, effective June 21, gave a very rigid priority to the coal mines in the matter of the use of open top cars for shipments to the Northwest, to New England and for bunkering purposes and directed Eastern railroads to send west thousands of box cars for the movement of the grain crops. Open top cars could be loaded when going in the direction of the coal mines, but, while this helped the movement of ore from the lakes, it was of little or no benefit to the producers of iron and steel, although it did enable Eastern mills and those located in the Mahoning and Shenango valleys to ship into the Pittsburgh district when cars were available and embargoes did not interfere. So few open top cars were reaching either the blast furnaces or the steel plants that there were long stretches during the first eight months of the year when production ran well in excess of shipments. Matters were no better with regard to those finished steel products, such as wire, nails, sheets, tin plate and strips, which, because they are not permeable by the elements, generally move from the mills in box cars. In the three months during which Eastern railroads were obliged to provide the grain producing sections with box cars, approximately 75,000 cars of this kind went west. Thousands passed empty through the important producing sections of Pittsburgh and Youngstown and thousands of tons of material were allowed to pile up at the plants because permission to load these cars was denied.

Very Serious Congestion

While all iron and steel producing districts north of the Mason and Dixon line were affected by these conditions, the territory within an arc, beginning at Detroit and running through Toledo to Columbus and Cincinnati, thence eastward to include Wheeling, Pittsburgh, Johnstown and northeast to Buffalo, was most seriously hampered, not so much in the matter of production as through inability to ship. In July, the accumulation of steel and iron in the Pittsburgh district was so great that the suggestion was made in all seriousness and given some consideration, that the plants shut down completely for a week or ten days to give the railroads a chance to clean up the congestions of freight along their lines. At the time the railroads serving this district were not moving freight on an average as much as 10 miles a day and there were frequent instances where it took a month to move a shipment a distance of about 30 miles. In an effort to secure relief from the coal car priority order, the traffic managers of the steel companies in Pittsburgh, Youngstown and Cleveland went to Washington to confer with the Interstate Commerce Commission late in July. At this conference, testimony was offered by the steel company traffic officials that approximately 1,500,000 tons of steel was piled awaiting shipment in the mills of Cleveland, Youngstown, Wheeling, Johnstown and Buffalo. The only relief given by the commission was a new definition of what constituted a coal car. The original order designated open top cars with sides of 36 in. or higher as coal cars; the modified order took cars with sides of less than 38 in. out of the coal carrying class. The benefit derived was slight and steel continued to pile up at most plants within the affected area. At one time more than 2,000,000 tons was piled, the great bulk of it in Pittsburgh, the Valleys and Cleveland. In November, the order giving the lakes priority on coal shipments was modified and then rescinded and later all restrictions on the use of open top cars by iron and steel producers were abrogated, but it was too late to be of help to the industry. "The water had gone over the wheel," for the demand for iron and steel, so urgent during the first eight months of the year, had decreased by November to very limited proportions.

It is impossible to obtain or even estimate the financial losses sustained by the industry as a result of its inability through the lack of normal transportation facilities, to ship all of its production. Possibly some line on the losses will be available in the earning statements for the last quarter and the last half of 1920. The more common impression, however, is that the losses will not be overwhelming, for the decline in the demand for iron and steel began before the summer was over and thereafter the tendency of production was progressively downward, and the flood of cancellations and suspensions of the early fall affected order books chiefly and did not leave much finished material on the hands of producers to be sold at the lower prices which came in the last two months of the year. The Steel Corporation subsidiaries benefited none from the huge premiums over the March 21, 1919, prices, to which they had steadfastly held throughout the period when the market was purely a sellers' affair. The Cor-

poration could have made more money by going along with the market, but it made money at its prices and lost little business, when the buying movement dwindled. The independents were the chief gainers by the hectic market of the early part of 1920 and also the chief losers when the tide of business ebbed.

Period of Many Woes

The period running about a year from Sept. 22, 1919, is aptly described as a nightmare. First came the strike of the iron and steel plant workmen, which failed almost before it began, although in some places, notably Cleveland, Youngstown, Wheeling and Johnstown, the effects of it were felt almost up to the beginning of 1920. The disastrous results of that strike for the strikers failed to deter the soft coal miners in the so-called central field from going out on strike Nov. 1, 1919. This trouble for about six weeks shut off production in all union mines and the shortage of coal thus created lasted well into 1920, the iron and steel industry in common with all others feeling the effects. The war time Fuel Administration was revived and with it the regulations governing the distribution. The iron and steel industry, an essential one during the war period, however, became non-essential when the Fuel Administration resumed functioning. Requirements of the railroads, public utilities, army, navy, Federal, State and Municipal departments and institutions, as well as domestic needs, all took preference over those of the iron and steel industry. Coal was sent to far distant points and it took tediously long periods to get the cars thus dispatched back to their own lines. In March it was calculated that as a result of the steel strike, the coal miners' dispute and the dislocation of transportation as a result of Federal regulations of coal distribution, the sheet makers had lost 73 days' production. There is no reason to suppose these influences were any less restrictive upon the output of other lines of finished steel. But the effect upon the activities of the industry from those causes were slight by comparison with those sustained from the railroad strike which started in Chicago on April 9, and was the forerunner of the paralysis of the railroads during the following few months. During this period, the express companies had to handle tons and tons of freight they otherwise never would have been called on to transport. Trucking was the means employed in shipping some products from Pittsburgh to as far as Detroit and even to New York and New England. For a number of weeks the railroads were unable to convey freight through yards and handled only solid trainloads going to a common destination. Steel plants located on or near the rivers and lakes were able to ship more tonnages than those less favored by location, and out of this will probably grow a more extensive future use of inland waterways.

Effect on the Markets

Marketwise, the effect of the conditions resulting from the 1919 labor troubles and the transportation conditions of 1920 was to bring an urgent spot or prompt demand for iron and steel from consumers who were unable to obtain shipments against orders and contracts they had previously placed. Coal went as high as $10 per ton at mines for steam grade and $12 for gas grade. Connellsville furnace coke sold at $19 per net ton at ovens and more than $20 was paid for a few small tonnages of foundry coke from that district. This meant correspondingly high prices throughout the country, for it still is the practice to base coke prices both beehive and by-product on the Connellsville base. Pig iron sold in several markets at $50, furnace, for No. 2 foundry and almost up to that level for the steel-making grades. Sales of sheet bars for conversion were made to Detroit automobile companies, unable otherwise to secure sufficient supplies of sheets, at $90 and $92, f.o.b. Pittsburgh. Rerolling billets sold at $75 for open-hearth steel and sales of forging billets were reported up to $90. These prices compared with the March 21, 1919, prices, Industrial Board schedules, adhered to by the Corporation subsidiaries consistently, of $42 for sheet bars, $38.50 for rerolling billets and $51 for forging billets. In finished lines, during the height of the urgent buying, which came chiefly from the automotive industry, wire nails sold as high as $6.50 base per keg, or double the price of the American Steel & Wire Co.; black sheets 9c. and galvanized sheets 10c. for the base gages; as compared with the Corporation bases of 4.35c. and 5.70c. respectively; strips, 7c. base, for hot-rolled and 10c. base and even 12c. base for cold-rolled, while cold-finished steel bars in the screw stock sizes went up to 10c., more than double what was regarded as the regular independent market price and almost triple the price established on the Industrial Board price of hot-rolled bars. Plates and bars reached 5c. for small tonnages. At this figure bars were more than 100 per cent above the Corporation base and plates only slightly less than 100 per cent above the Corporation price. As high as 4c. was done on structural shapes but not for long nor for much tonnage. But this market, which was entirely a sellers' affair, began to pass in August and entirely had disappeared by the first of November. Since then buyers have had most to say about prices.

How Pittsburgh Suffered

It is one of the anomalies of the conditions of the past year that Pittsburgh, which was only slightly and for a comparatively brief period affected by the steel strike of 1919, suffered most from the poor transportation conditions. Chicago, where the switchmen's strike began, was back in less than a month to practically the status that ruled just before the trouble started. Transportation troubles in the South were unimportant. This may be ascribed to the fact that this section primarily and essentially is agricultural and, unlike the Northern railroads, the Southern roads do not have to compete with industry for a share of the supply of labor. This is what made it so hard for the Northern roads to combat the strike, for in all industries wages never before were as high as they were early in 1920. The effect of the railroad strike in the East was sharp but comparatively short lived.

In retrospect, it must be said that the industry as a whole "crossed a good many bridges before it came to them," in the fears expressed about the deficit in the supply as compared with the demand. If the plant congestions which caused so much money to be tied up, in other words, "frozen" credits, had not occurred, if the railroad demands had been up to expectations, if the automobile industry had not crumbled and other users of iron and steel had continued bold buyers, the fears of shortages not only would have been justified but would have really developed. The surprising thing about the whole situation is that production for the year reached the proportions it did.

Railroad Buying in 1920 Disappointing

Car and Locomotive Purchases Fall Under Averages for Past Six Years—Orders for Rails Only Approach Normal

BEFORE the war, the railroads were credited with a normal consumption of about one-quarter of the steel produced in the country. During the world conflict, railroad buying was at a low ebb, but when this year the carriers were returned to their owners and later were granted substantial rate increases, a revival in buying on the old scale was looked for. The expectations of the steel trade were not realized and 1920 will rank among the poorest years since 1900 from the standpoint of railroad buying.

Early in the year, considerable railroad work was let, particularly following the termination of Govern-

ment operation. In April, the month after the reversion of the carriers to their owners, about one-third of the total freight car orders of the year was entered. Locomotive buying was also heavier in that month, amounting to one-quarter of the buying for the year. Again in October, a little more than a month after the rate advances, the scale of buying increased somewhat, only to decline in November. The railroads, when they first regained control of their properties, concentrated their attention on the repair of their rolling stock, which was found to be much the worse for the wear it underwent under the stress of war conditions. Numerous car repair contracts were awarded, but much of this work was delayed because of slow steel deliveries and in the fall when the steel market began to show signs of weakness, some uncompleted contracts were cancelled. Rails were bought in large tonnages, probably to the extent of the mills' capacity under the trying operating conditions encountered during the first six months of the year. Bridge and building construction was also undertaken to a greater degree than in the previous year, although the aggregate tonnage of steel involved was by no means up to expectations.

Buying of Freight Cars

Purchases of freight cars for the year amount close to 60,000, as compared with about 22,000 in 1919. While an improvement over 1919 is indicated, the total is exceedingly low as compared with preceding years. According to statistics compiled by the *Railway Age*, the average of freight car purchases for the 13 years, 1901 to 1913 inclusive (including purchases by private lines, industrials and Canadian roads), was 180,400, while the average for the six years, 1914 to 1919 inclusive, was 98,000.

It will be noted that purchases before the war were nearly twice those of the years following its inception, and that no progress was made in 1920 towards a return to the pre-war scale of buying. Statistics covering locomotive buying tell the same story. According to information compiled by the Association of Railway Executives, locomotive purchases for 1920 will total 1500. The average number bought during the 13 years preceding the European war was 3800 per year and in the six years, 1914 to 1919 inclusive, 1900. These averages may be discounted slightly because they are based on figures compiled by the *Railway Age*, which include purchases by private car lines, industrials and Canadian lines, but giving due consideration to that fact, it is apparent that locomotive buying during 1920 was far short of meeting normal needs.

Rail Purchases

Accurate statistics covering rail purchases during 1920 are not available, but it is probable that the total was close to 2,000,000 tons. Annual consumption of rails in this country, according to data compiled by the American Iron and Steel Institute, ranged from a minimum of 1,726,224 tons in 1908 to a maximum of 3,654,794 in 1906, during the 13 year period before the war; and from 1,568,402 tons in 1919 to a maximum of 2,440,755 tons in 1917 during the years 1914 to 1919 inclusive. Purchases thus far made for 1921 rolling indicate that the total tonnage for that year will exceed 2,600,000 and may reach as high as 3,000,000. It is apparent, then, that buying of rails is again getting back on a pre-war scale.

Policy of the Companies

Railroad bridge and building construction was not on a generous scale in 1920. Here and there a long-delayed project was resumed, as, for example, the Chicago Union Station, but on the whole, extensive work which could be postponed was not undertaken. One of the few large railroad bridges let during the year was that of the Cincinnati Southern at Cincinnati, involving 14,000 tons. In a recent communication to THE IRON AGE, George D. Dixon, vice-president Pennsylvania Railroad Co., stated that capital expenditures on fixed property in 1920 were largely confined to those which would promote the movement of existing rolling stock. The congestion existing at the time private operation was resumed made extensions for the purpose of producing additional traffic for the time being impracticable, and required that the traffic already in existence and incapable of being moved should receive the first provision in facilities. He stated that expenditures were now being made to the extent of $250,000,000 on the enlargement of roundhouses and engine terminal capacity, the increase of shops, machinery and tools for the repair of equipment, the extension of sidings, additional yard tracks, interlocking devices, heavier rail and ballast, double tracking, strengthening of bridges, reducing grades, etc. Rails, of course, account for a large percentage of this total and just how the remainder has been distributed and how much of the total has thus far been spent was not made clear.

Machine tool purchases during 1920, although on a larger scale than in the previous year, were not nearly so large as expected. Prominent among the lines which bought equipment were the Atlantic Coast Line, which purchased $500,000 worth of tools; the Santa Fe, which bought to the extent of about $250,000; the Rock Island, Burlington and Norfolk & Western, which bought about $200,000 worth each; the Texas & Pacific with an outlay of $140,000, the Pere Marquette, with expenditures of $100,000; the Chicago & Northwestern and the Union Pacific with about $65,000 purchases each, and the Illinois Central with an outlay of $50,000. Other lines which bought to a greater or lesser extent were the New York Central, the Big Four, the Hocking Valley, the Long Island, the Lehigh Valley, the Pennsylvania, the St. Louis-San Francisco, the Chicago, Milwaukee & St. Paul, the Baltimore & Ohio, the New Haven, the Nickel Plate, the Maine Central, and the Chesapeake & Ohio.

The need for railroad buying always seems pressing during a period of business activity and heavy traffic. Generally in such periods prices are high and those who direct purchases are tempted to postpone as much buying as possible. On the other hand, when traffic declines, car shortage disappears with it and the revenues of the carriers diminish. The psychological effect of temporarily adequate transportation coupled with reduced earnings is to encourage a further postponement of buying. The country is now passing through a period of diminishing railroad traffic and the policy of the railroads as evidenced in their expenditures during the coming months is awaited with interest.

Ore Movement Makes Good Showing

Despite Delays Due to Strikes on Railroads, Shipments Are Large—Season Not Very Profitable

THE outstanding feature of the Lake Superior iron ore industry during 1920 was the transportation difficulties that resulted in a sharp curtailment of lake shipments during the first half of the shipping season. However, as conditions developed later in the year, many consumers doubtless feel that they are fortunate that delays in transportation prevented them from placing as much ore in their yards or on lake front docks as they had originally planned. Now that furnaces are not eating into their ore piles as fast as they would with normal operations, they are not compelled to carry as large inventories as they would, had shipments not been curtailed, and the surplus ore at furnace yards and lower lake ports on May 1 is not expected to be much above the average of the past few years. Consequently, shippers feel that when there is a revival in the iron and steel industry the ore industry will experience a corresponding revival without having to wait until large surplus ore stocks are used up.

It is estimated that the amount of ore on docks and

in furnace yards on May 1 will be approximately 21,000,000 tons, this estimate being based on an average pig iron production of 2,600,000 tons per month from December to April, inclusive.

The Season's Shipments

Ore shipments by water during the 1920 season amounted to 58,527,226 gross tons. Estimating the all rail movement at 1,500,000 tons, the total movement for the season was approximately 60,000,000 tons. This compares with lake and all rail shipments during the previous four years as follows: 1919, 48,812,522 tons; 1918, 62,836,172 tons; 1917, 64,437,003 tons, and 1916, 66,658,466 tons. There was more ore on docks at the close of navigation in 1920 than ever before on that date. The balance on Lake Erie docks Dec. 1 was 10,955,868 gross tons. This compares with 10,454,843 tons in 1919, 10,376,509 tons in 1918, 10,023,743 tons in 1917 and 9,958,306 tons in 1916.

The amount of ore on docks and in furnace yards May 1 for the past nine years was as follows:

	Tons
1912	17,694,000
1913	20,280,000
1914	20,490,000
1915	19,533,000
1916	10,570,000
1917	15,683,000
1918	20,977,000
1919	20,664,000
1920	18,348,000
1921 (estimated)	21,000,000

Ore Buying Starts Early

The ore buying movement in 1920 started in February, prices being established Feb. 2 at an advance of $1 a ton above the previous year. Previous to that advance, no change in ore prices had been made since October, 1918. With a promise of a good year in the iron and steel industry, early buying was rather heavy, although some consumers carried over large stocks because the steel strike late in 1919 had caused a curtailment in furnace operations. Some furnaces also bought conservatively because of the higher ore prices. Some additional sales were made in June and July, but later in the year there was little activity in the market. Lake Superior ore sales to Eastern furnaces were fairly heavy and considerable ore was sold to Virginia furnaces, which had previously used very little of this ore, but apparently felt that with the higher pig iron prices prevailing they could use the higher priced ore from the Lake Superior district. Heavy demands on the foundry industry early in the year resulted in large sales of high phosphorus ore for foundry pig iron, but the demand for Bessemer ore was not strong in 1920.

Transportation Troubles

The transportation difficulties in the movement of ore began early in the season and were due largely to the car shortage resulting from the railroad strike. Because of this situation, shipments from docks were slow before the opening of navigation and a late start was made in moving ore down the lakes. The entire lake fleet did not get in operation until June and during the fore part of the season ore firms were a month behind on their shipping schedules. The car shortage caused serious congestion at the lower lake unloading docks fully one-half of the shipping season, boats being held up from three to eleven days waiting for cars to take their cargoes. Had conditions been normal, a 10,000-ton boat would have been unloaded in about 24 hours. Because of the lack of cars, the bulk of the ore was sent to lake front furnaces and railroad ore docks during the early part of the season.

Pro-rating Not Adopted

The danger of an ore shortage due to the transportation delays became so serious that some of the ore shippers proposed in May that shipments be pro-rated according to the requirements of consumers. Some claimed that unless a pro-rating plan was adopted they would be unable to move all the ore they had sold. A meeting of the various interests affected was held to consider the proposal to pro-rate ore shipments and this resulted in a disagreement and deadlock. Then the matter was submitted to the Interstate Commerce Commission, which failed to order the placing of a pro-rating plan into effect.

The Priority Orders

Little coal moved to the Northwest during the early part of the summer owing to the car shortage and to the fact that coal dealers delayed placing orders because of high prices, and an acute coal shortage was threatened in that section this winter. The Interstate Commerce Commission was appealed to and late in July issued priority orders, diverting open top cars to the coal trade for shipments to lake ports and for lake shipments to the Northwest. The effect of this order was soon felt in the ore trade, for when coal was unloaded the empty cars were available for taking ore back to the interior furnaces. However, a large share of the cars that came to the lake ports had got out of repair under the Government's railroad management, and while they could be used for coal they could not carry ore.

Shipments Increase

It was well along in August before a better car supply made a marked improvement in ore shipments. Shippers were still far behind in their schedules and there was considerable talk of an ore shortage, but this fear was soon dispelled. There had been curtailment in furnace operations earlier in the year due to scarcity of coal and coke, another result of the car shortage, and the slump in the iron and steel industry the latter part of the year caused furnace men to scale down their ore requirements to carry them over the winter. With the changed conditions came some cancellations of ore and deferring of shipments until this year. Consequently, while shippers were unable to deliver all the ore they had sold there was an easing up in the situation during the last few weeks of the season of navigation, and if any furnace runs short of ore before next spring, it will have no difficulty in securing what it wants from the large stock piles on the docks.

Profits Reduced

The 1920 season was not a very profitable one for the ore shippers. When prices were established at the $1 a ton advance, the shippers agreed to absorb any advance made over the vessel rate that prevailed in 1919, that rate being 80c. per ton from the head of the lakes. A few charters were made at the $1 rate, but vessel men demanded a higher rate and in May the rate was advanced to $1.10 net, which was the prevailing rate for the season. Consequently, only 70c. of the advance in ore prices went to the shipper, and out of this had to come increased mining costs, including a 10 per cent wage advance granted to the miners Feb. 1, and in addition there was an increase in royalties on ore from some of the mines.

Rail Carrying Charges

The year was marked by consideration of various proposed advances in the rail carrying charges for ore, but the only change in rail rates was the flat 40 per cent increase in the rate from the lower lake ports to interior furnaces, conforming to the general increase in railroad rates in the Eastern territory that became effective in September, increasing the rate on ore from 65c. to 91c. per ton from lower lake ports to the Mahoning and Shenango Valleys, and from 91c. to $1.274 to the Pittsburgh district.

In June the railroads asked for a flat increase of 22c. per ton on ore from lower lake ports to interior furnaces. A little later, the Jones & Laughlin Steel Co. proposed that an advance of 74c. per ton on ore be added to the 1917 rates for shipments from the mines to the upper lake docks and that this increase in rates be distributed between the Northern roads and the roads carrying the ore from the lower lake ports to the furnaces. Under this company's plan the rail movement at both ends of the lake would have made a joint haul. The object of the plan was to prevent lake front furnaces from enjoying any undue advantages by reason of not being compelled to pay any portion of the increase in rates that would be taxed against the interior furnaces. This plan brought out strong opposition from various consuming interests, particularly the lake front furnaces. There was also

vigorous opposition to any further advance in the rate from the mines to upper lake ports under the blanket freight rate advance, shippers contending that the rates from the mines to the upper lake docks were already excessive because of the already sharp advance made in 1918.

Late in July the Interstate Commerce Commission in advancing freight rates added 40 per cent to the rate from Lake Erie ports, but exempted the haul from the mines to upper lake ports from the flat advance in rates made in that territory. The proposal of the Jones & Laughlin Steel Co. was rejected. Later in the year the Lake Superior Iron Ore Association decided to start proceedings before the Interstate Commerce Commission to attempt to secure a reduction in the ore rates from the mines to upper lake docks that have existed since their advance because of the war time emergency in 1918.

Surprising Achievement of Blast Furnaces

Large Production Despite Many Serious Handicaps—Rapid Decline of Pig Iron Prices in Last Quarter of 1920

DESPITE the great obstacles to production due to railroad and coal strikes, car shortage and allied difficulties, output of pig iron in 1920 showed the somewhat surprising total of 36,250,000 tons, which compares very favorably with the highest records attained in preceding years. In 1916 the total production of iron was 39,434,797 tons; in 1917, 38,621,216 tons; in 1918, 39,054,644 tons, and in 1919, 31,015,364 tons.

These high records in 1916, 1917 and 1918 were made under stress of war conditions, when every ounce of energy and material was expended to producing the greatest possible results. Moreover, there was no transportation trouble in those years approximating in seriousness that with which the pig iron industry struggled in 1920.

A significant fact is that production of steel making iron in 1920 showed no appreciable loss in 1920 as compared with 1916, 1917 and 1918; the year 1919 may safely be left out of account in this comparison because of the slump in production in the early part of that year, following the signing of the armistice. Such shortage of iron as existed in 1920 was largely due to loss of output by merchant furnaces. Steel companies, having their own cars to transport coal and their own by-product ovens for making coke, did not suffer from coke shortage in the same degree as the merchant furnaces.

Even allowing for such loss by merchant furnaces, their output totaled about 8,000,000 tons during the year. In 1917 the amount of iron made for sale was 11,650,332 tons; in 1918, 10,768,540 tons and in 1919, 8,690,227 tons, these figures being obtained from statistics published by the American Iron and Steel Institute.

Shortage of Transportation

While there was an actual shortage in merchant iron in 1920 as compared with preceding years, this shortage was made more acute by the shortage in distributing facilities, due to railroad strikes and the coal strike. Embargoes were put into effect by many of the roads, which meant that some consumers got sufficient iron and others did not. Those who could not obtain shipments on their regular contracts were forced into the market to obtain spot supplies wherever they could get them, with the result that buyers assisted in the upward price movement by bidding prices up on themselves. The high points reached during the year were close to the record high quotations recorded just prior to the announcement of price fixing by the Government in 1917.

A comparison of the record high prices in the two years follows:

	1920	1917
Basic, Valley furnace	$48.50	$52.00
Bessemer, Pittsburgh	50.46	55.95
No. 2 X, Philadelphia	53.51	53.00
No. 2 foundry, Chicago	46.00	55.00
No. 2 foundry, Birmingham	42.00	47.00

Rapid Decline in Prices

A most remarkable thing about the course of pig iron prices in 1920 is that the descent from the high peaks, which occurred in the last four months of the year, was more precipitous than anything heretofore known in American pig iron history.

In the 10-year pre-war period from 1904 to 1913, inclusive, the highest prices for pig iron were reached late in 1906 and early in 1907. The rise in prices had been gradual. For example, Bessemer pig iron at Pittsburgh rose from a low point of $14.85 in July, 1905, to its high point of $23.75, the average for December, 1906. The decline was just as gradual as Bessemer iron did not reach a point near $15 until October, 1908, when the average for the month was $15.71. In other grades of iron, the trend was similar. The highest point reached by eastern Pennsylvania 2 X iron at Philadelphia during this 10-year period was $25.55, which was the average for April, 1907.

Thus it will be seen that at no time outside of the war period have pig iron prices turned somersaults as rapidly as in 1920. For example, from Jan. 1 to Aug. 26 Bessemer iron at Pittsburgh rose $11.50 a ton, Valley basic, $12.50 a ton and No. 2 foundry $11 a ton. Yet the descent from these peak prices was accomplished in about eight weeks, from Oct. 1 to Nov. 25. In other words, the work of eight months was undone in eight weeks.

At the close of 1920, Bessemer iron at Pittsburgh was $2 below its Jan. 1, 1920, price, while Valley basic had a net decline of $3 for the year and No. 2 foundry was down $3 or $4 a ton from its price at the beginning of the year.

Causes of High Prices

Mounting prices of pig iron during the year were caused, first, by the increase in wages on Feb. 1 and in the cost of ore; also by the higher prices paid for coke after the Government released control of prices in March. The coal strike was a further contributing factor, causing a scarcity of coke and higher coke prices. These things added greatly to the cost of making pig iron, while the railroad strike and the shortage of cars contributed to its scarcity through faulty distribution.

Coke was a great source of worry to pig iron producers during several months of the year. While the revived Fuel Administration restored the war prices of $6 for furnace coke and $7 for foundry coke, and nominally these prices were maximum over the first quarter of the year, furnace interests only rarely could buy as low as the Government price and, for several weeks prior to the termination of fixed prices, were paying around $10 a ton. From the end of June until the middle of October, spot tonnages could not be bought for less than $17, while as high as $19 was frequently paid. These prices meant light shipments on contracts and compelled spot purchases by those who ordinarily received their full supply on contract. The freight rate increase, effective Aug. 26, it was estimated, added $1.50 to $2 a ton to producing costs in the Valley district.

Appearance of Resale Iron

Conditions in other producing and consuming districts were governed very largely by the same factors which prevailed in the Valleys. Resale foundry iron began making its appearance in some districts by midsummer, due to the slump in the automobile industry. It was not until fall, however, that the offerings of resale iron had an important effect on prices other than to halt in August the upward advance on furnace iron. Throughout the last quarter of the year, resale iron was largely instrumental in fixing values. Fur-

naces were slow to meet this competition, many preferring to maintain quotations while shipping out as much iron as they could on contracts. In this they were helped by improved railroad service in September and many consumers began receiving so much iron that they became alarmed and requested shipments held up. Requests for cancellations followed as general business showed signs of a slowing down. In most instances furnaces refused to cancel contracts, but accepted orders for suspension of shipments, with the result that they are carrying over into 1921 large backlogs, on which, however, they have no shipping instructions. Practically no iron contracting for 1921 has been done. As furnaces reached the end of their orders on which they could ship, many of them went out of blast, the shut-downs during December being unusually large.

High Prices at Philadelphia

In the Eastern Pennsylvania district, prices of pig iron rose slightly above those of any other district, basic iron, delivered in that district, having been quoted at $51.26 on Sept. 7, while Eastern Pennsylvania No. 2 X reached its peak of $53.51 on Aug. 31.

Foundry and Scrap Prices, Cincinnati, 1920

Month	Southern Foundry No. 2	Northern Foundry No. 2	No. 1 R.R. wrot., Net Ton	No. 1 Mach., Net Ton
January	$41.80	$40.93	$23.00	$31.75
February	$43.60	44.18	26.50	33.50
March	43.60	45.18	26.50	34.75
April	44.00	46.20	26.50	35.50
May	45.60	46.80	25.50	35.50
June	45.60	46.80	25.50	35.50
July	45.60	46.80	25.50	35.50
August	45.78	47.73	25.50	35.50
September	46.50	48.92	25.30	35.30
October	46.50	48.27	23.00	35.00
November	42.50	46.27	19.25	26.75
December	41.10	38.12	15.00	23.80

Virginia 2 X, delivered Philadelphia, was at the same time quoted at $56.72. The downward movement in this district began about the middle of October and continued until the middle of December, at which time there had been sales of No. 2 X at $34.79, delivered

Eastern Pennsylvania Pig Iron Prices, 1920

	Basic Del'v'd East. Pa.	Standard Low Phos. (Furnace)	Gray Forge	Virginia 2X, Del'v'd
January	$39.19	$48.25	$40.23	$45.35
February	41.90	49.50	40.50	47.35
March	44.24	50.00	43.00	47.55
April	44.80	50.00	43.00	48.85
May	44.80	51.00	43.00	49.85
June	44.66	52.40	43.00	50.15
July	43.70	54.00	43.00	50.10
August	47.21	57.00	45.46	54.90
September	51.26	60.00	47.10	55.48
October	49.60	60.00	47.10	54.74
November	41.94	60.00	44.64	50.59
December	44.15	48.00	38.74	43.50

Average prices on Eastern Pennsylvania 2X iron are given in table on page ——.

Philadelphia. Basic declined from its peak of $51.26 to $33.86, delivered, within about the same length of time.

New England Gets Alabama Iron By Boat

In New England the shortage of foundry iron was critical during the time when transportation was tied up, the embargoes on shipments to New England being more drastic than to almost any section. In May resale foundry iron sold as high as $70, delivered, but furnaces did not exact such prices. The shortage of railroad transportation forced several New England foundries to turn to Alabama iron, which was brought in by boat. There was also an increased movement of iron by barge from the Buffalo district.

Narrower Fluctuations at Cincinnati

There were not such wide fluctuations in iron prices in the Cincinnati market as in other districts. Southern No. 2 foundry reached its maximum in September, when the average price, delivery at Cincinnati, was $46.70. At the end of the year, Southern No. 2 was quoted at $38.50 to $42.50, Cincinnati, still a high price as compared with quotations in other districts. Producers in the Birmingham district were holding for $38, Birmingham, up to the end of 1920 and resale iron dominated the Cincinnati market during the final quarter of the year. Northern No. 2 foundry, delivered at Cincinnati, was about on a par with Southern iron throughout the year, sometimes slightly lower and occasionally slightly higher, but the spread was seldom more than $2 or $3.

Conditions at Chicago

In the Chicago district, conditions were much the same throughout the year as in other districts. Both producers and consumers were greatly hampered by

Average Monthly Pig Iron Prices, f.o.b. Valley Furnace, per Gross Ton, 1920

	Bessemer	Basic	No. 2 Foundry	Gray Forge
January	$38.60	$37.40	$39.40	$37.60
February	41.50	42.25	41.50	40.25
March	42.00	41.50	41.25	41.00
April	42.20	42.40	42.80	41.00
May	42.625	43.25	44.25	41.75
June	43.00	43.75	45.00	42.25
July	45.60	45.60	45.00	43.00
August	47.375	48.00	47.00	44.50
September	48.50	48.50	49.40	49.00
October	47.25	43.75	46.50	45.50
November	40.25	37.375	40.25	39.25
December	35.00	33.00	36.20	35.20

coal and railroad strikes and car shortage. No. 2 foundry at Chicago reached a maximum of $46, and began its drop about mid-October. Resale iron came more frequently into the market, causing rapid declines. In November, 10,000 tons of foundry iron from the Ford furnaces at River Rouge, Mich., was offered at as low as $30, furnace. Most, if not all, of the iron disposed of on this basis was in exchange for castings. At the close of the year No. 2 foundry at Chicago had declined to $33. The course of prices in other grades at Chicago was very similar to that in foundry iron. Southern iron in that month was being offered for sale on a basis of $35, Birmingham.

Lower Prices Expected

While furnace prices up to the end of 1920 were generally maintained at a few dollars a ton above those at which resale iron could be bought, it has been generally predicted that lower furnace prices will be made on the first important business that develops in 1921, for indications point to lower ore prices and to much lower costs for coke than those which prevailed in the last half of 1920. Such coke as has been sold for delivery in the first half of 1921 has been on a basis of five tons of coke per ton of basic iron, Valley furnace.

Unusual Record of Semi-Finished Steel

Efforts of Automobile Companies to Maintain Schedules an Important Factor in Advancing Prices

ANXIETY on the part of the automobile industry to maintain the production schedule it mapped out for the year ending June 30, 1920, may be said to have been largely, if not entirely, responsible for the heights to which semi-finished steel prices soared in 1920. The willingness of this industry to pay any price to secure steel to round out its plans was a prime factor in sales early in the year of sheet bars at $90 and $92, Pittsburgh, and sales of rerolling billets at $75, and even higher for a few tonnages, are directly traceable to the demands of the automobile manufacturers. These prices compared with the Industrial Board schedules of $42 and $38.50 respectively. It is more than probable that the prices of independent makers would have advanced from the March 21, 1919, bases even if the automobile makers had been less eager buyers, because the strike of 1919 put a considerable dent in production in the final quarter of that year and created a shortage

that extended into the first quarter of 1920. The burden was increased by the 10 per cent wage increase made Feb. 1, 1920. But if the automotive industry had been content to curtail production in keeping with the loss of production in finished steel, due to the steel and coal miners' strikes and the dislocation of transportation facilities from weather and other causes early in 1920, the big prices paid for semi-finished steel would probably never have been recorded.

Average Monthly Prices on Semi-Finished Steel, 1920, Pittsburgh

	Bessemer Billets	Open Hearth Billets	Wire Rods
January	$48.00	$48.00	$60.00
February	55.25	55.25	63.75
March	60.00	60.00	70.00
April	60.00	60.00	70.00
May	60.00	60.00	72.50
June	60.00	60.00	75.00
July	62.00	65.00	75.00
August	61.25	61.25	75.00
September	59.00	59.00	75.00
October	55.00	55.00	75.00
November	51.25	51.25	68.75
December	43.50	43.50	57.00

Strangely enough, one of the automobile makers who played a conspicuous part in the bidding up of steel prices was the one to start the shakedown of the last half of the year.

High prices for one or two forms of semi-finished steel mean high prices for all forms, for of course the ingots are directed into the best paying channels and away from those where the return is least. While there was a good demand throughout most of the year for wire rods, due to the fact that small manufacturers were able to sell nails and other common wire products at fancy prices, this does not entirely explain sales at $75 and even $80. The missing part is that it was easier to roll sheet bars and they were more profitable even at a lower price than wire rods at $75 and $80. Consequently steel was diverted from the rod mills to the sheet bar and billet mills. It was not big demand for plates that gave high value to slabs, but the same reasons that contributed to the high prices of rods. Producers of all kinds of finished steel fell way behind their obligations as a result of the labor disturbances of the latter part of 1919, and the chaotic fuel and transportation conditions of the forepart of 1920. The production of no finished lines suffered more from these causes than did sheets and bars. As both enter so heavily into the manufacture of automobiles, trucks and tractors, makers were confronted with the problem either of cutting production or finding supplies that would be brought out by high prices. They chose the latter course and when the finished products could not be obtained in sufficient quantities, the semi-finished material was bought for conversion.

The first half of the year saw steadily mounting prices in all forms of semi-finished steel, but the automobile industry began to feel the effects of over-inflation in June, and while prices held fairly well for a while thereafter, the tendency was progressively lower, starting with August and running to the end of the year. Curtailment of finished steel production was so constant in the last quarter of the year as to steadily reduce purchases of semi-finished material and the end of the year found independent finishing capacity dangerously close to the zero point and the demand for billets, sheet bars, slabs and wire rods limited even at the prices of the Steel Corporation.

Railroad and Shipyard Demand for Plates

Disappointment Caused by Attitude of Both Industries—Building of Vessels Declines

FAILURE of the railroads upon their return to private management on March 1, 1920, to enter the market for much needed equipment, or following the big increase in freight rates effective Aug. 26, constituted one of the several disappointments which plate manufacturers experienced in 1920. For months the steel manufacturers had looked forward to the ending of Government control to be followed by heavy railroad purchases. In Chicago, a considerable business was in sight for a time, about 35,000 cars being before builders in that district, but only a few orders were placed, the others being indefinitely postponed. The explanation was that prices were too high.

It might be stated in passing that though plates, shapes and bars are the principal materials for railroad cars, these products, even at the prices which prevailed at the time the inquiries came out, would contribute only slightly to the prices quoted on completed cars by builders. Car construction is an assembling proposition and most companies buy steel and parts according to specifications. The steel is cut to standard sizes for the type of car to be put together, and except for the punching of the plates and shapes, is ready for use as received from the mills. High labor costs probably were one reason for the stiff prices builders were obliged to ask for completed cars, but this was not nearly as important a factor in the prices as were the extremely stiff prices which had been established by the manufacturers of the patented parts, such as axles, wheels, brakes and journal boxes. Car builders in the Pittsburgh district had experiences similar to those in Chicago; the railroads put out inquiries only to withdraw them upon discovering the cost. Such business as came out in the East also was far out of proportion to the inquiries. The upshot of the whole matter was a decision upon the part of railroad managements to repair such cars as could be repaired. This brought out a fair amount of business in plates, shapes and bars, but the total was negligible by comparison with the hopes and expectations of the steel companies.

The switchmen's strike, which started early in April and was a factor in the paralysis of the railroads for several weeks thereafter, emphasized the shortage of railroad equipment and broke down to a large degree any opposition there might have been at the time to the demand of the railroads then before the Interstate Commerce Commission for a liberal freight rate increase. Railroad transportation conditions were so desperate that shippers were inclined to favor any movement that might lead to improvement in the service and facilities of the roads. Manufacturers of Indiana Harbor, East Chicago and Hammond telegraphed the Interstate Commerce Commission favoring the increase and recommending prompt action. Because the earnings of the railroads generally have increased since the present freight tariffs have been in effect, and this has not been accompanied by equipment purchases, there has been inclination by some men of the iron and steel industry to complain and to even go so far as to suggest a downward revision in keeping with prices of commodities on the theory that opposition of the most stern kind to the increase would have developed if it had been known that the railroads were not going to buy.

The importance of railroad equipments as an outlet for steel may be gleaned from the fact that the 120-ton coal car used by the Virginian Railroad contains about 10 tons of plates and in all about 18 tons of steel, including axles. The all-steel box car, bought principally by the Pennsylvania Railroad, takes 7300 lb. of plates, 5454 lb. of shapes and 1830 lb. of bars, or about 7.3 tons of steel. A 50-ton gondola of standard specification takes 13,221 lb. of plates; a standard 70-ton hopper car, 19,144 lb. of plates and a standard 50-ton hopper car, 13,756 lb. of plates. The only encouraging feature of the car orders has been that the proportion of steel construction has been larger than usual.

Shipbuilding Requirements Disappointing

Shipbuilding demand for plates also was disappointing. Eastern mills early in the year had a good many export orders for ship plates. In the Middle West,

manufacturers did considerable business with Pacific coast shipyards and for export to the Far East. The effect of the financial panic in Japan brought on by the slump in the silk market was heavy cancellations of plate orders in June and the throwing back upon the domestic markets of large tonnages which had moved as far as the seaboard. Owing to the lack of railroad buying of any account, with a sharp decline in fabricating demands because of the uncertainties of deliveries created by the railroad situation, and lessening demand from the tank builders, the strong market of the early part of the year began to weaken in June and showed no rallying power during the remainder of the year. The strength of the market was built upon the fact that all of the plants of the country were choked with orders, a condition due in no small measure to the loss of production during the labor unrest of the final quarter of 1919 and the difficulties attendant upon securing fuel and making shipments at the beginning of the year. Independents, which were getting the bulk of the business as a result of the inability of the Steel Corporation to make specified deliveries, were getting from 4c. up during the first quarter of the year, but summer saw their prices back at 3.50c. An inquiry at this time for 13,000 tons by the Pennsylvania Railroad brought a quotation of 3.25c. and at the beginning of the last quarter of the year that road bought 2000 tons at 3c. in the East. The Standard Oil Co. was able to secure several thousand tons at 2.90c. to 2.95c., while in the Middle West a car-roofing manufacturer bought a round lot from independents at 2.65c., the Corporation base. The rapid melting away of order books in the last two months of the year through unhampered deliveries, attended by cautious buying and numerous cancellations, forced independent prices down to the Corporation base, the Inland Steel Co. starting the reduction early in November and being followed later by makers to the East. The Middle Western makers felt first and heaviest the closing down of several shipyards of the Pacific Coast in October. The completion of the Shipping Board program was another blow to the plate market.

New Construction Moves Slowly

Many Causes for Failure to Engage in Building Enterprises—Hopes for 1921

THOUGH the early part of last year gave promise of a revival of new construction and the return of the railroads to private management was expected to bring out at least some railroad bridge orders, neither hope was realized. That there was not more building in 1920 is ascribable less to the cost of steel than to the fact that other building materials remained high during the time when construction could be pursued, while labor was scarce, inefficient and very costly. Strikes were of frequent occurrence in all of the big cities of the country and another restrictive factor was that the fabricating companies, being uncertain as to deliveries of plain material over the long period when the railroads were crippled either by the strike or the lack of sufficient cars could give no positive promises as to shipments of fabricated materials. More restrictive than any of the influences and by some considered to be more restrictive than all other factors combined, was the attitude of the bankers all over the country toward loans for new construction. Those industrial interests which could finance plant additions and new building from earnings without recourse to the banks went ahead to a fair degree, but even such activity halted during the last half of the year when dwindling demands created the feeling that the new construction might not be needed, or that when it was required it could be done at less cost.

A fairly good market existed during the fore part of 1920, but to a considerable extent the demand reflected the inability of buyers to obtain steel on orders entered late in 1919. Independent company prices went as high as 4c. base, often f. o. b. mill instead of Pittsburgh, but around the middle of the year 3.10c. became the maximum as far as sales of any considerable size were concerned and then 3c. became top while the end of the year found the independents both east and west at the Steel Corporation base of 2.45c., Pittsburgh.

It was a rather slim year for both the steel companies and the fabricators, but with the decline in building materials and a probable lowering of labor costs, not a few look to see construction demands in 1921 lead the steel industry out of the depression so general at the close of 1920.

Bar Market Affected by Strikes

Labor Troubles Cause Serious Congestion—Trucks Help in Shipments—Prices Decline Rapidly

IT took a comparatively large part of 1920 to correct or make good the loss of production of merchant bars sustained from the steel plant and coal miners' strikes of 1919. No kind of finishing capacity suffered more than the bar mills from those causes, and huge tonnages of backed-up business existed at the beginning of the year. This was notably the case with Pittsburgh and Youngstown manufacturers. The steel strike was particularly effective in the latter city, which contains not only some of the largest and more modern bar mills of the Carnegie Steel Co., but also the Republic Iron & Steel Co. and the Youngstown Sheet & Tube Co., by no means small factors in the supply. The Pittsburgh city mills of the Carnegie Steel Co. operated only intermittently during the period of acute labor unrest. The Jones & Laughlin Steel Co., although not much affected by the strikes, carried much business from 1919 into 1920.

Choked condition of the makers in the Pittsburgh and Youngstown districts, and for that matter in the Middle West, made the acceptance of new business almost impossible. Eastern mills were not much better off as far as their ability to take on new business was concerned and with the automobile industry striving earnestly to hold to its producing schedules, and other consumers also in need of supplies, there developed an acute shortage which enabled those manufacturers who could make prompt shipments to name practically their own prices. Sales of prompt shipment bars were readily made in all markets at 4.50c. and some makers of cold finished bars of screw stock sizes paid up to 5c. for small tonnages. Though a Middle Western implement manufacturer succeeded in placing a contract for last half tonnages with a Pittsburgh independent at 2.90c. this was more than $20 a ton below what most independents currently were getting on quarterly contracts, and although the reaction in business began to affect the steel market as early as June, some Eastern mills had not receded from the price of 4c. up to the beginning of the fourth quarter of the year. When the market did weaken as the year drew to a close, it dropped with a thud. The Jones & Laughlin Steel Co., around the end of November, cut its price, which had been 3c., to 2.35c., and this step immediately was followed by other independents.

Unusual Transportation Methods

As with all other steel products, transportation

conditions were a big factor in keeping up the bar market. Large tonnages were moved from the Duquesne, Pa., works of the Carnegie Steel Co. by trucks because the railroads could not provide the cars or were hampered by congestion. As late as early fall there was a big accumulation of bars at this plant, which was among the last to feel the effects of the betterment which finally came in railroad performance and car supplies.

Important causes for the break in prices were the slump in the automobile industry; the lack of any important railroad business; the more conservative attitude of buyers growing out of the decline in general business, and finally the crumbling in October of the agricultural implement business, due to an almost complete cessation of buying by the farmers on account of the break in farm products prices. From a condition of full capacity operation, when fuel shortages and transportation conditions or other causes did not interfere, independent bar mill capacity in the last few weeks of the year dropped closer to zero point than at any time in five years. One effect of the scarcity of steel bars has been to stimulate the use of iron bars and those rolled from old rails and to send them to extremely high prices. Common iron bars moved up to 4c. at Chicago and even higher in Pittsburgh, and in the East, while old rail bars commanded as much as those from new billets over a considerable period.

Sheet and Tin Plate Trades in 1920

Some Interesting Changes in Demand Due to the War and Other Causes—Heavy in Tin Commitments

THE independent sheet and tin plate manufacturers had a very profitable operation in 1920. Their output was large and their prices were relatively high. The sheet and tin plate departments of the United States Steel Corporation experienced less prosperity. Their prices were held down to the Industrial Board schedule, 3.55c for blue annealed sheets, 4.35c for black sheets, 5.70c for galvanized sheets and $7 per base box for 100-lb. coke tin plates, while their operations were seriously curtailed by car shortages and steel shortage. In the last two months of the year, however, the Steel Corporation sheet and tin mills ran much better than the independent mills, and this helped to make up. In the year as a whole the Steel Corporation's proportion of the total output of sheets and tin plates was probably slightly in excess of the Corporation's proportion of capacity. In 1919 the Corporation's tin plate output was 48.44 per cent of the total tin plate output, that being slightly more than the proportionate capacity. There are no statistics available as to relative sheet production in 1919, and of course no authoritative statistics at all for 1920.

Tonnage Outputs

The magnitude of the tonnage output of the sheet and tin plate industries is not universally recognized. In 1919 the output of the jobbing mills, sheet mills and tin mills was slightly greater than the output of sheared and universal plates ¼ in. and heavier. Throwing plates under ¼ in. in with heavier plates, the proportions became 47 per cent and 53 per cent. The probability is that in the near future there will be a year in which the jobbing, sheet and tin mill output will exceed the output of all the plate mills.

A rough estimate of the 1920 output, in gross tons, is as follows:

Sheets, 12 gage and thicker.....	400,000
Sheets, 13 gage and thinner.....	2,200,000
Tin mill black	200,000
Tin and terne plate	1,400,000
Total	4,200,000

Broadly speaking, outputs in 1920 were about 20 per cent greater than those of 1919. The output of black sheets probably broke the record, made in 1917, while tin plate fell behind the outputs of both 1917 and 1918. In the case of all three descriptions of mills, the output was far below the capacity, there having been great operating difficulties, on account of shortage of steel and shortage of cars in which to ship the product. The steel shortage fell with particular heaviness upon the sheet and tin plate industries, for besides the total production of steel being restricted, the movement of sheet bars to the detached sheet and tin mills was greatly interfered with. The tin mills were particularly affected, as very few of them are attached to steel mills. Less than half as many tin mills were in operation in the second half of April as in the first half of November, although April is normally one of the busiest months of the year for the tin mills, and November is traditionally the slackest month. The year's output was but slightly affected by lack of orders, as that experience was confined to the late weeks of the year, and to the independents.

The Sheet Demand

The demand for the various descriptions of sheets showed a very unusual distribution in 1920. The demand for sheets for building purposes, for lath, siding, ceiling, etc., was particularly light. For electrical sheets the demand was very heavy. Taking the year as a whole, the sheet demand of the automobile industry was only moderately heavy. For finely finished sheets for metal furniture and goods of that general character, the demand was heavy, though not so much on account of this class of consumers being particularly active as because in the natural course of events that consuming industry is growing rapidly.

The demand for automobile sheets presented the appearance of being greater than it really was, for two reasons, the limited capacity for producing the particular kinds of sheets required by the automobile industry and the eagerness with which automobile and parts makers bid fancy prices for material. Except for the rather large tonnage of heavy gage sheets required for frames, neary all the sheets used in the automobile industry require much pickling, and the shortage in these sheets was due not to a shortage of sheets in general, of the gages involved, but to the limitations in pickling capacity. For months the demand for pickled sheets was so great that galvanizing was neglected, and galvanized sheets commanded prices in the open market far in excess of prices that would be dictated either by the volume of demand or by the cost of manufacture. It is hardly necessary to point out that while the demand of the automobile industry was the most conspicuous feature of the sheet market in 1920, the tonnage requirements of the industry are not particularly large by comparison with the total capacity for producing sheets of all descriptions. Undoubtedly the sheet and jobbing mills can produce more than 3,000,000 gross tons of sheets in a year, and it is doubtful whether a year's output of trucks and passenger automobiles, the majority of the latter being very light, will greatly exceed 2,000,000.

No precise reference to sheet prices in 1920 can be made. The American Sheet & Tin Plate Co. adhered to the Industrial Board prices of March 21, 1919, 3.55c for blue annealed, No. 10 gage, 4.35c for black, 28 gage, and 5.70c for galvanized, 28 gage. In general the independents sold at higher prices, but there was a very wide range of prices, depending on tonnage. If sales in lots of 200 tons were included, the top of the market would probably be set at $20 to $40 a ton higher than if sales in 1,000-ton lots and over were included. Before the war an advance or decline of $2 a ton in "the market" was an event.

Tin Plate Conditions

In tin plate there was less price irregularity than in sheets. The American Sheet & Tin Plate Co., in pursuance with Steel Corporation policy, maintained

the Industrial Board price of $7 per base box for 100-lb. cokes. In contracting for the first half of the year, the independents observed this price to a great extent, while for the second half of the year the independents in most cases secured higher prices. Even at that, however, there was no very large tonnage sold at over $8, and thus tin plate's excursion into the higher realms was much less spectacular than that of sheets.

The demand for tin plate continues to show a tendency to broaden. Even in a few years the change in percentage distribution is very noticeable, for it is not so many years ago that "packers' cans" or cans for packing seasonable food products easily constituted the heavy end of a year's total demand. The war, of course, produced special conditions, tin plate being in particular demand. The readjustment after the war has involved two things. During the war the scarcity of tin plate led to much effort to substitute, particularly by the use of fibre containers. It was feared that the tin plate industry would not regain all its trade, but after the war the trade easily got back largely into the old channel of using tin plate. On the other hand, however, the special demand created by war conditions for canned goods has not continued. It appears, for instance, that the packers of canned milk were somewhat surprised to find that when people, both in the United States and Europe, were afforded the opportunity to return to the fresh product they were disposed to embrace the opportunity. Nevertheless there will doubtless always be a heavy demand for canned milk.

While the steel industry in general has had small losses to abso b on account of price declines during the latter part of 1920, the tin plate makers have had very large losses in their tin commitments. During the first four months of 1920, tin ruled at above 60c., a decline then setting in which carried the market down into the thirties after Nov. 1. As the mills must buy their tin several months ahead, there were few tin plate producers at the close of the year that did not show a loss running into six figures in tin, comparing their tin stocks and commitments with the current market. The profits of the year, however, were such that these losses can readily be absorbed.

Coke Soars to High Prices

Prominent Factor in the Cost of Making Pig Iron—Decrease in Demand for Beehive Product

IT is doubtful whether even the high prices reached for Connellsville coke in 1917, prior to governmental price control, which came at a time when producing costs were much less than in 1920, yielded such big returns to the producers as those of the past year and while all conditions are possible of repetition, it probably will be a long time before there will be again such a combination of circumstances as to make possible prices of $19 per net ton at ovens for furnace grade and $20 for foundry coke. Those prices not only were obtained on tonnages of considerable size, but actually were exceeded for small lots. No such prices were reached before in this century and the record prices for 1917 were about $6 per ton below the peak levels of the past year. THE IRON AGE records show that in August, 1917, the average minimum price of furnace coke for prompt shipment from Connellsville ovens was $13.60, while in the same month and year the average price of foundry coke was $13.20 per net ton at ovens. Beginning with May of last year and extending to the first of November, the lowest monthly average on furnace grade was $12 per net ton at ovens and in August it was $17.75, while in the slump of the past few months it remained above the fixed Government price of $6. The average monthly price of foundry coke for prompt delivery rose from $10.20 per net ton at ovens in April to $18.75 in August and also remained above the Government maximum in the slump of the last three months of the year. The average for the whole year was $11.33 for furnace grade and $12.31 for foundry. These figures probably are too low for the reason that they include furnace coke at $6 and foundry at $7 during the first three months of the year.

The Fuel Administration, resurrected as a result of the coal strike, reimposed late in 1919 the war period price maximums, but observance of them was on the part of the few rather than the many, and it is no secret that by one subterfuge or another, spot tonnages of either grade that were available at these prices were extremely small and they were not actual minimum prices. This, however, merely is a circumstance and has little bearing upon the fact that Connellsville oven operators reaped a harvest in 1920.

The conditions which made possible the extremely high prices over so much of the year just ended may be summed up in the fact that the demand for pig iron, until late in the summer, was urgent at constantly rising prices; steel companies which could not secure enough coal to produce from their own by-product ovens their coke requirements, bought freely of the beehive oven product; during a greater part of the year, coal was wanted both for domestic and export accounts at fancy prices. The natural result was that unless as good a price could be obtained for coke, coal rather than coke was produced, and the tendency to ship coal also was strengthened during the period of transportation difficulties by the fact that cars were usually more plenty for coal than for coke shipments. It might be added that many districts either entirely or largely self-sustained in the matter of coke supplies had to draw upon the Connellsville region because of the loss of coal production occasioned by the miners' strike late in 1919, and the difficulty experienced in securing supplies in 1920, first as a result of the Government regulation of distribution and later because of car shortages, the priorities granted the Northwest and New England and the fact that exporters were literally "paying all out-doors" to secure tonnages. It is hardly to be wondered at that the advantage was strongly in favor of the coke producers in view of these circumstances.

Increase of By-Product Coke

The past year saw a halting of the downward tendency of beehive oven production and the figures for the year may be expected to show that coke made in the modern by-product ovens and in the old-fashioned ovens, as in 1919, was about a standoff with the advantage, however, in favor of the newer method of making coke. Latest figures compiled by the United States Geological Survey show a gain of more than 1,000,000 tons in the production of beehive oven coke as compared with 1919, much of this gain being in the Connellsville district, where, according to the compilation of the Connellsville *Courier*, there was a gain in 1920 over 1919 of only a little less than 1,000,000 tons. New by-product ovens capacity that came into operation in the past year was much less than in the previous few years and new projects have been few owing to the high cost of construction. Capacity capable of carbonizing between 3,500,000 and 4,000,000 tons of coal annually was completed; and on a basis of a 70 per cent yield of coke this will mean between 2,150,000 and 2,800,000 tons of coke. No doubt lower costs will lead to the building of more by-product ovens in 1920, and every new battery of these ovens means the passing of as many of the old type producers. By-product oven construction companies, despite the new lease of life the beehive ovens had last year, still insist that before 1935 all metallurgical requirements will be supplied by coke made in the modern plants.

The outlook for the new year is for much lower

Iron and Steel Prices for Twenty-One Years

Monthly Averages Computed from the Weekly Market Quotations of "The Iron Age" in the Period 1900-1920

(With Supplement)

ACCOMPANYING this issue of THE IRON AGE is our annual chart, in which lines are plotted to indicate the course of prices for pig iron, Bessemer steel billets and some leading forms of finished iron and steel in the 23 years ended with 1920. The diagrams are based on monthly averages of prices quoted week by week in our market reports from the leading selling centers. The table below, which gives the monthly average prices on which the chart is based, includes also the average prices of No. 2 X foundry pig iron at Philadelphia, which have not been put in graphic form.

Bessemer Pig Iron at Pittsburgh, Dollars per Gross Ton (2240 lb.)

	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$24.90	$13.15	$16.70	$22.15	$13.91	$16.85	$18.35	$23.15	$19.00	$17.34	$19.90	$15.90	$15.05	$18.15	$14.96	$14.59	$21.58	$35.95	$37.25	$33.60	$40.00
February	24.80	14.43	16.93	21.45	13.66	16.41	18.35	22.85	17.90	16.78	19.34	15.90	14.90	18.15	15.09	14.55	21.51	35.95	37.25	33.60	42.90
March	24.72	16.31	17.37	21.85	14.25	16.35	18.28	22.85	17.86	16.25	18.60	15.90	15.09	18.15	15.09	14.55	21.75	37.70	37.25	32.54	43.40
April	24.70	16.75	18.75	21.28	14.18	16.35	18.19	23.35	17.49	15.78	18.27	15.90	15.15	17.90	14.90	14.55	21.95	42.20	36.15	29.35	43.60
May	21.00	16.30	20.75	20.01	13.60	16.16	18.10	24.01	16.93	15.84	17.52	15.90	15.13	17.70	14.90	14.59	21.95	45.15	36.15	29.35	44.03
June	19.72	16.00	21.56	19.72	12.81	16.65	18.23	24.27	16.90	16.05	16.60	15.90	15.15	17.14	14.90	14.70	21.95	54.70	36.38	29.35	44.80
July	16.75	16.00	21.60	18.89	12.40	14.85	18.41	23.55	16.83	16.46	16.40	15.90	15.20	16.70	14.90	14.95	21.95	57.45	36.60	29.35	47.15
August	15.60	15.75	21.62	18.35	12.81	15.20	19.00	22.90	16.23	17.03	16.09	15.90	15.46	16.52	14.90	15.95	21.95	54.75	36.60	29.35	49.11
September	13.87	15.75	21.75	17.22	12.63	15.91	19.54	22.90	15.90	18.05	15.90	15.90	16.15	16.65	14.90	16.85	22.26	48.03	36.60	29.35	50.46
October	13.06	15.89	21.75	16.05	13.10	16.54	20.35	22.00	15.71	19.53	15.90	15.44	17.80	16.60	14.84	16.95	24.08	37.25	36.60	29.35	49.16
November	13.48	16.00	21.68	15.18	14.85	17.85	22.85	20.65	16.59	19.90	15.82	15.00	18.02	16.02	14.59	17.51	30.15	37.25	36.60	31.26	41.10
December	13.43	16.31	21.75	14.40	16.65	18.35	23.75	19.34	17.40	19.90	15.90	15.03	18.15	15.77	14.70	19.65	35.68	37.25	36.80	36.65	36.96

Bessemer Steel Billets at Pittsburgh, Dollars per Gross Ton

January	$34.50	$19.75	$27.50	$29.60	$23.00	$22.75	$26.25	$29.40	$28.00	$25.00	$27.50	$23.00	$20.00	$28.30	$20.13	$19.25	$32.00	$63.00	$47.50	$43.50	$48.00
February	34.87	20.21	29.37	29.87	23.00	23.50	26.50	29.50	28.00	25.00	27.50	23.00	20.00	28.50	21.00	19.50	33.50	65.00	47.50	43.50	55.25
March	33.00	22.88	31.25	30.62	23.00	24.00	26.70	29.00	28.00	23.00	27.50	23.00	19.75	28.50	21.00	19.70	42.40	66.25	47.50	42.25	60.00
April	32.00	24.00	31.50	30.25	23.00	24.00	27.00	30.12	28.00	23.00	26.75	23.00	20.00	28.50	20.80	20.00	45.00	73.75	47.50	38.50	60.00
May	28.90	24.00	32.20	30.37	23.00	23.50	26.40	30.30	28.00	23.00	26.12	22.60	20.80	27.37	20.00	20.00	45.00	86.00	47.50	38.50	60.00
June	27.25	24.38	32.37	28.87	23.00	22.00	26.63	29.62	25.75	23.00	25.30	21.00	20.87	26.50	19.50	20.50	43.50	98.75	47.50	38.50	61.00
July	21.00	24.00	31.75	27.60	23.00	22.00	27.25	30.00	25.00	23.50	25.00	21.00	21.50	26.60	19.00	21.38	41.00	100.00	47.50	38.50	62.50
August	18.20	24.20	31.06	27.00	23.00	24.00	27.80	29.25	25.00	24.13	24.62	21.00	22.12	26.00	20.25	23.13	44.20	86.00	47.50	38.50	61.00
September	16.93	24.88	29.50	27.00	20.00	25.00	28.00	29.37	25.00	25.00	24.40	20.75	23.62	24.87	21.00	24.10	45.00	66.25	47.50	38.50	58.74
October	16.50	26.70	29.70	27.00	19.50	25.62	28.00	28.20	25.00	26.25	23.75	20.00	26.00	23.30	20.00	24.63	46.25	49.38	47.50	38.50	55.00
November	18.95	27.00	28.50	24.00	20.25	26.00	28.88	28.00	25.00	27.13	23.30	19.50	27.00	21.00	19.25	26.50	52.00	47.50	47.50	41.38	49.70
December	19.75	27.50	29.12	23.00	21.20	26.00	29.50	28.00	25.00	27.50	23.00	19.25	27.00	20.00	19.00	30.60	57.50	47.50	45.50	46.00	43.50

Basic Pig Iron, f.o.b. Mahoning or Shenango Valley Furnace, Dollars per Gross Ton

January	.....	.....	.....	.....	.....	$15.46	$17.06	$21.90	$16.90	$15.50	$16.87	$13.25	$12.35	$16.41	$12.50	$12.50	$17.81	$30.00	$33.00	$30.00	$37.40
February	.....	.....	.....	.....	.....	15.25	16.82	22.00	15.97	15.12	16.31	13.65	12.25	16.30	13.19	12.50	17.69	30.00	33.00	30.00	42.25
March	.....	.....	.....	.....	.....	15.55	16.85	21.50	15.62	14.94	16.00	13.75	12.81	16.11	13.00	12.50	18.20	32.25	33.00	28.94	41.50
April	.....	.....	.....	.....	.....	15.06	16.88	21.50	15.25	14.05	15.94	13.75	13.00	15.87	13.00	12.50	18.13	38.75	32.00	25.75	42.40
May	.....	.....	.....	.....	.....	15.06	17.00	22.90	14.91	14.12	15.19	13.32	13.00	15.15	13.00	12.50	18.00	41.60	32.00	25.75	43.25
June	.....	.....	.....	.....	$11.76	14.60	16.94	22.40	15.25	14.62	14.70	13.05	13.12	14.50	13.00	12.59	18.00	48.75	32.00	25.75	44.00
July	.....	.....	.....	.....	11.20	14.00	17.12	21.75	14.51	15.05	14.50	13.12	13.40	14.37	13.00	12.74	18.00	52.50	32.00	25.75	45.85
August	.....	.....	.....	.....	11.69	14.32	17.70	21.25	14.69	15.25	14.12	13.00	13.94	14.06	13.00	14.06	18.00	51.20	32.00	25.75	48.10
September	.....	.....	.....	.....	11.60	14.86	18.44	20.06	14.43	15.90	13.70	12.80	13.47	14.00	13.00	14.75	18.31	42.75	32.00	25.75	48.50
October	.....	.....	.....	.....	12.19	15.25	19.55	19.50	14.04	16.94	13.15	12.52	15.98	13.90	12.81	15.00	19.88	33.00	33.00	25.75	43.75
November	.....	.....	.....	.....	14.00	16.87	21.37	18.12	14.72	17.25	13.25	12.42	16.37	13.09	12.48	15.75	25.10	33.00	33.00	28.31	36.50
December	.....	.....	.....	.....	15.70	16.75	21.50	17.50	15.60	17.05	13.40	12.25	16.50	12.71	12.50	17.50	30.00	33.00	33.00	34.25	33.00

Southern No. 2 Foundry Pig Iron at Cincinnati, Dollars per Gross Ton

January	$20.69	$13.45	$14.55	$21.65	$12.37	$16.25	$16.75	$26.00	$16.15	$16.25	$17.25	$14.25	$13.25	$16.95	$13.88	$12.40	$17.90	$26.10	$35.90	$34.60	$41.80
February	20.50	13.12	14.75	21.50	12.12	16.25	16.75	26.00	15.75	16.13	17.06	14.25	13.31	16.69	13.81	12.40	17.90	27.53	35.90	34.60	43.60
March	20.30	14.00	14.75	21.37	12.10	16.25	16.65	26.00	15.50	15.05	16.30	14.25	13.50	16.31	14.00	12.27	17.90	31.90	35.90	33.54	43.60
April	20.19	14.50	16.87	20.15	12.50	16.25	16.63	25.06	15.20	14.25	15.37	14.25	13.75	15.65	13.75	12.34	17.90	37.40	35.90	30.35	44.00
May	19.75	13.85	18.35	18.87	12.25	15.81	16.75	24.25	14.75	14.50	15.00	13.95	14.15	14.94	13.75	12.40	17.90	41.90	35.90	29.85	45.60
June	18.75	13.37	20.19	17.75	11.80	14.65	16.44	24.10	15.25	14.70	14.85	13.44	14.25	14.06	13.63	12.50	17.34	45.15	36.08	28.39	45.60
July	16.81	13.00	20.75	16.15	11.81	13.94	16.06	23.85	15.00	15.75	14.75	13.25	14.70	13.75	13.30	12.71	16.90	49.90	36.60	28.35	45.60
August	14.25	13.00	23.06	15.19	12.00	14.40	17.30	23.00	15.25	16.38	14.31	13.45	15.06	14.06	13.25	13.71	16.70	49.90	36.60	30.40	45.78
September	13.62	13.06	25.00	14.75	12.00	14.37	18.69	21.50	15.65	17.35	14.25	13.31	15.87	14.25	13.25	14.15	17.28	49.90	36.60	31.25	46.50
October	12.87	13.75	25.65	13.50	12.81	15.31	20.00	20.95	15.75	17.88	14.25	13.25	16.80	14.35	12.90	14.78	18.03	49.38	37.60	31.60	46.50
November	12.95	14.00	23.62	12.00	15.19	16.60	23.38	19.50	16.00	17.75	14.25	13.20	17.25	13.87	12.90	16.15	22.40	35.90	37.60	34.35	42.50
December	13.75	14.25	22.44	12.05	15.85	16.75	25.00	17.00	16.25	17.45	14.25	13.19	17.25	13.95	12.50	17.10	25.90	35.90	37.60	38.60	41.10

Local No. 2 Foundry Pig Iron at Chicago (at Furnace), Dollars per Gross Ton

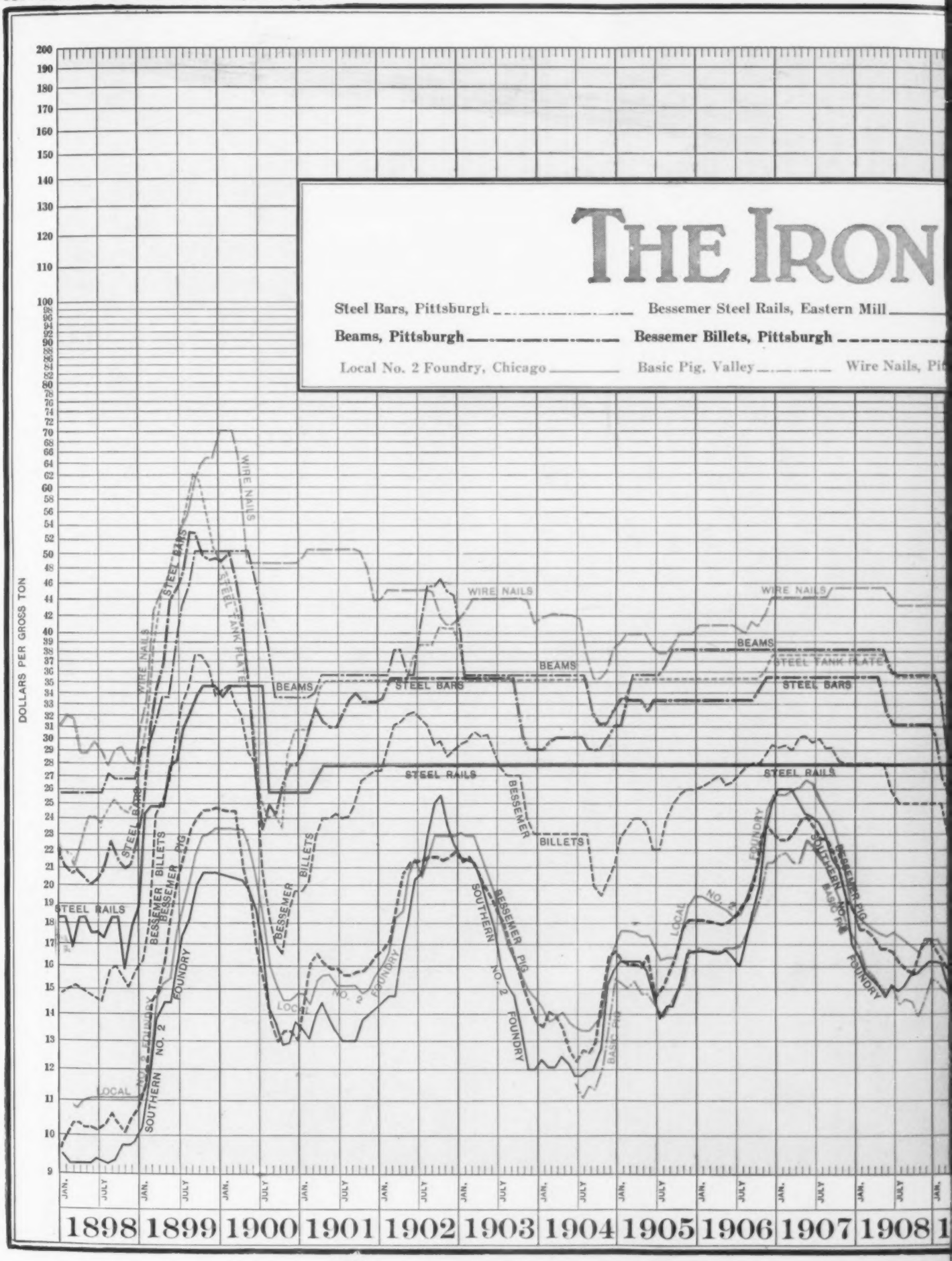
January	$23.85	$15.10	$16.25	$23.45	$14.47	$17.85	$19.60	$25.85	$18.45	$17.35	$19.00	$15.50	$14.00	$17.90	$13.75	$13.00	$18.50	$30.00	$33.00	$31.00	$40.00
February	23.85	14.60	16.85	23.35	13.91	17.85	19.41	25.85	18.16	16.75	19.00	15.50	14.00	17.31	14.00	13.00	18.50	32.00	33.00	31.00	42.25
March	23.85	15.60	18.51	23.22	14.05	17.80	19.35	26.10	17.85	16.50	18.30	15.50	14.00	17.25	14.25	12.95	18.70	36.00	33.00	29.94	43.00
April	23.72	15.85	18.97	22.87	14.35	17.60	19.10	26.35	17.73	16.50	17.50	15.00	14.00	17.00	14.25	13.00	19.00	39.25	33.00	26.75	43.00
May	22.65	15.85	20.85	20.72	13.85	17.60	18.90	26.85	17.63	16.50	17.06	15.00	14.50	16.00	14.06	13.00	19.00	43.80	33.00	26.75	43.00
June	20.72	15.35	21.85	19.85	13.70	17.00	18.54	26.60	17.73	16.50	16.75	15.00	14.50	15.62	13.69	13.00	19.00	51.00	33.00	26.75	43.40
July	18.60	15.35	21.60	18.25	13.60	16.47	18.60	25.55	17.55	17.00	16.56	14.87	14.70	14.70	13.75	13.00	19.00	55.00	33.00	26.75	45.25
August	16.25	15.35	22.10	17.22	13.60	16.60	19.45	24.85	17.35	17.13	16.50	14.50	15.37	15.00	13.69	13.44	18.40	55.00	33.00	26.75	46.00
September	15.35	15.35	23.35	16.41	13.85	16.60	20.16	24.10	17.05	18.70	16.40	14.50	16.00	15.00	13.25	13.90	18.13	54.67	33.00	26.75	46.00
October	14.85	15.10	23.35	15.70	14.10	17.66	21.48	22.45	16.85	19.00	16.00	14.46	17.00	15.00	12.94	14.63	19.63	33.00	34.00	27.75	44.50
November	14.85	15.23	23.35	15.10	15.98	19.15	24.70	20.66	17.10	19.00	16.00	14.09	17.75	14.87	12.56	17.13	25.80	33.00	34.00	31.00	39.40
December	15.10	15.85	23.35	14.81	16.95	19.60	25.85	18.80	17.35	19.00	16.00	14.00	18.00	14.30	13.00	18.10	29.50	33.00	34.00	38.75	34.50

Standard Brands Eastern Pennsylvania No. 2 X Foundry Pig Iron at Philadelphia, Dollars per Gross Ton

January	$22.70	$15.50	$16.75	$22.45	$14.69	$17.50	$18.50	$24.80	$18.25	$17.25	$19.00	$15.50	$14.85	$18.25	$14.65	$14.25	$19.94	$30.10	$34.25	$36.15	$44.10
February	22.56	15.31	17.19	22.25	14.50	17.50	18.50	25.87	18.25	17.00	18.69	15.50	14.85	18.25	14.94	14.25	20.00	31.88	34.25	36.15	45.10
March	22.31	15.12	18.81	22.25	14.80	17.56	18.35	25.00	18.12	16.37	18.00	15.50	14.92	17.77	15.00	14.25	20.05	37.31	34.25	34.39	45.53
April	21.75	15.46	19.62	21.87	15.00	17.75	18.44	24.81	17.65	16.20	17.75	15.50	15.00	17.40	15.00	14.25	20.50	41.38	34.25	31.90	46.85
May	20.60	15.19	19.75	20.06	14.75	17.81	18.50	25.55	16.94	16.06	17.00	15.50	15.18	16.75	14.81	14.25	20.50	43.60	34.25	30.70	47.10
June	18.75	15.06	20.94	19.19	14.50	16.75	18.44	24.62	16.62	16.42	16.55	15.25	15.31	16.19	14.75	14.25	19.94	48.19	34.29	29.50	47.15
July	16.37	15.00	22.30	18.10	14.31	16.12	18.25	23.06	16.50	16.50	16.25	15.00	15.70	15.60	14.75	14.31	19.75	53.13	34.40	29.08	48.15
August	16.15	14.97	22.00	16.87	14.25	16.25	19.00	21.90	16.50	17.00	16.00	15.00	15.87	15.60	14.75	14.94	19.55	53.00	34.40	29.60	51.96
September	15.56	14.80	22.00	16.12	14.25	16.43	20.44	20.50	16.62	18.05	16.00	15.00	16.59	15.83	14.75	16.00	19.50	51.67	34.40	30.70	53.51
October	15.00	15.25	22.12	15.20	14.43	17.25	21.12	19.85	16.75	18.69	15.81	15.00	17.60	15.95	14.63	16.25	20.31	34.25	38.85	32.10	52.53
November	15.35	15.37	23.37	15.00	15.75	18.05	23.30	18.94	17.00	19.00	15.68	14.95	18.25	15.56	14.50	17.12	24.90	34.25	39.15	35.35	44.99
December	15.62	15.75	23.00	15.00	16.90	18.25	24.00	18.84	17.25	19.00	15.50	14.85	18.25	15.20	14.25	19.05	29.25	34.25	39.15	40.10	34.79

Soft Steel Bars at Pittsburgh, Cents per Pound

January	2.22	1.25	1.50	1.60	1.30	1.40	1.50	1.60	1.60	1.40	1.50	1.40	1.15	1.70	1.20	1.10	2.03	3.15	2.90	2.70	2.75
February	2.21	1.30	1.51	1.60	1.30	1.40	1.50	1.60	1.60	1.35	1.50	1.40	1.12	1.70	1.20	1.10	2.31	3.25	2.90	2.70	3.00
March	2.23	1.40	1.60	1.60	1.33	1.50	1.50	1.60	1.60	1.20	1.45	1.40	1.10	1.85	1.20	1.15	2.65	3.63	2.90	2.61	3.63
April	2.10	1.47	1.60	1.60	1.35	1.50	1.50	1.60	1.60	1.15	1.45	1.40	1.16	1.84	1.15	1.20	2.88	3.75	2.90	2.35	3.75
May	1.91	1.41	1.60	1.60	1.35	1.50	1.50	1.60	1.60	1.19	1.45	1.37	1.20	1.70	1.14	1.20	3.00	4.00	2.90	2.35	3.63
June	1.52	1.40	1.60	1.60	1.35	1.46	1.50	1.60	1.45	1.20	1.45	1.25	1.20	1.69	1.11	1.21	2.75	4.25	2.90	2.35	3.50
July	1.19	1.40	1.60	1.60	1.35	1.50	1.50	1.60	1.40	1.27	1.45	1.23	1.25	1.50	1.12	1.25	2.63	4.50	2.90	2.35	3.50
August	1.05	1.44	1.60	1.60	1.35	1.50	1.50	1.60	1.40	1.32	1.40	1.20	1.30	1.40	1.19	1.30	2.56	4.30	2.90	2.35	3.25
September	1.12	1.50	1.60	1.60	1.31	1.50	1.50	1.60	1.40	1.39	1.40	1.19	1.37	1.40	1.20	1.34	2.60	4.00	2.90	2.35	3.25
October	1.09	1.53	1.60	1.60	1.30	1.50	1.50	1.60	1.40	1.51	1.40	1.12	1.45	1.30	1.15	1.44	2.75	2.90	2.90	2.39	3.13
November	1.18	1.50	1.60	1.37	1.31	1.50	1.54	1.60	1.40	1.50	1.40	1.08	1.55	1.29	1.10	1.62	2.83	2.90	2.90	2.69	2.87
December	1.25	1.50	1.60	1.30	1.34	1.50	1.60	1.60	1.40	1.50	1.40	1.12	1.66	1.21	1.07	1.84	3.00	2.90	2.80	2.75	2.35



Fluctuations in the Prices of Crude an

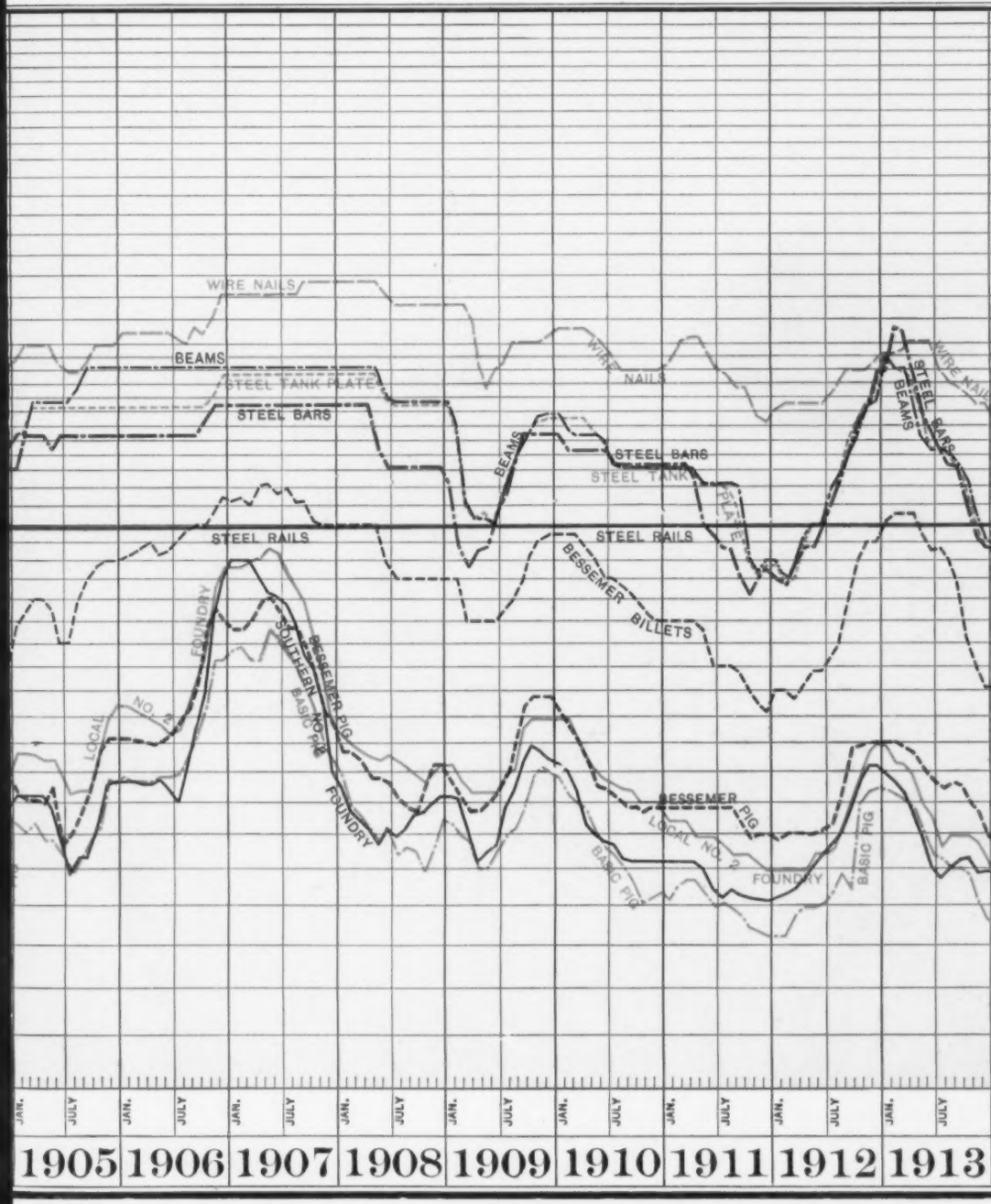
1898, to Jan. 1

THE IRON AGE

Bessemer Steel Rails, Eastern Mill — Bessemer Pig, Pittsburgh

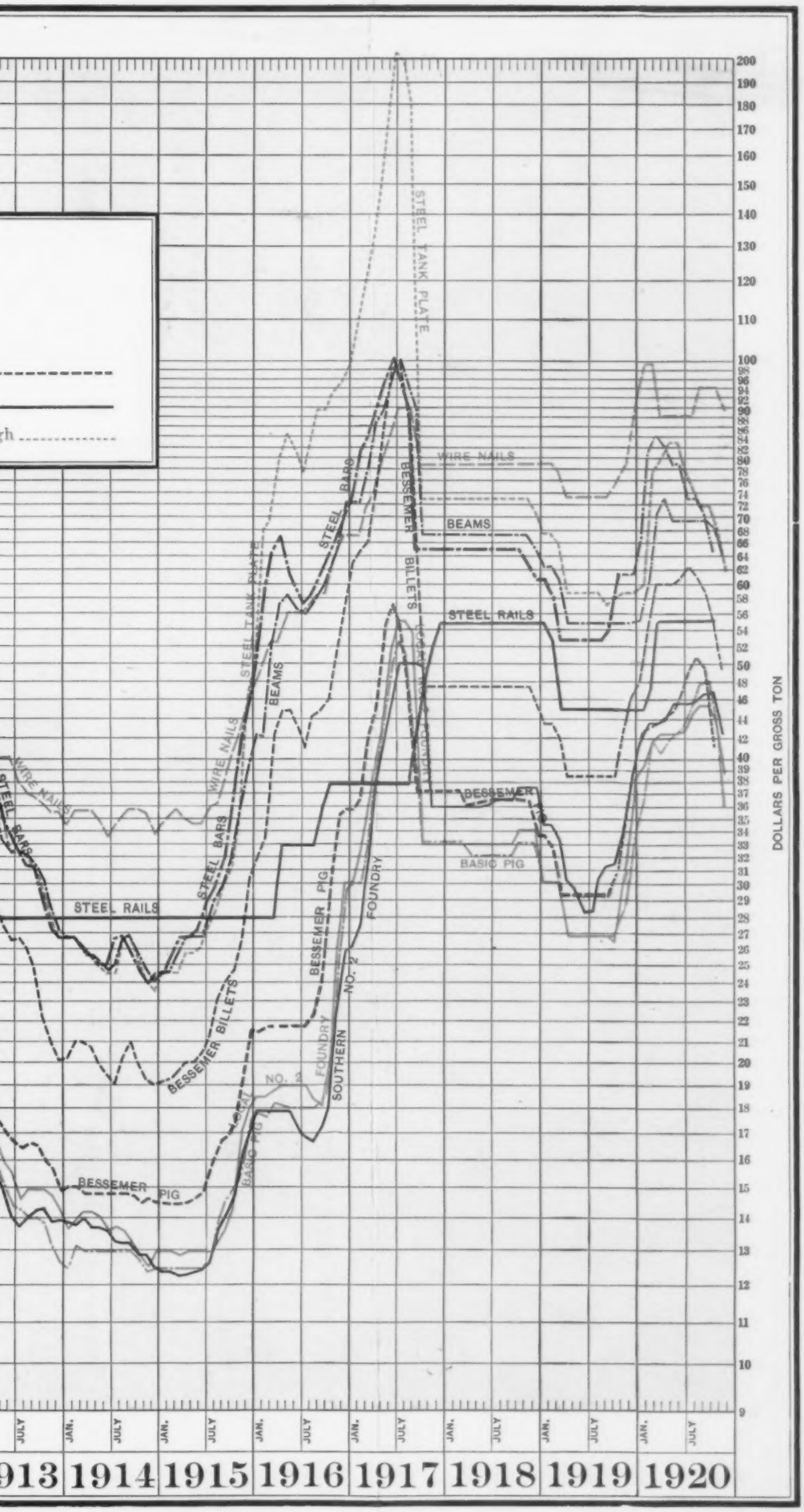
Bessemer Billets, Pittsburgh — Southern No. 2 Foundry, Cin.

Basic Pig, Valley — Wire Nails, Pittsburgh — Steel Tank Plate, Pittsburgh



...e Prices of Crude and Finished Iron and Ste...

1898, to Jan. 1, 1921—Gross Tons



Steel from Jan. 1,

Tank Plates at Pittsburgh, Cents per Pound

	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	2.22	1.40	1.60	1.75	1.60	1.50	1.60	1.70	1.70	1.60	1.55	1.40	1.15	1.75	1.20	1.10	2.25	4.45	3.25	3.00	2.72
February	2.17	1.40	1.60	1.60	1.60	1.50	1.60	1.70	1.70	1.52	1.55	1.40	1.11	1.71	1.20	1.10	2.56	4.88	3.25	3.00	3.50
March	2.03	1.47	1.60	1.60	1.60	1.60	1.60	1.70	1.70	1.30	1.55	1.40	1.12	1.70	1.18	1.10	3.10	5.25	3.25	2.91	3.63
April	1.87	1.57	1.60	1.60	1.60	1.60	1.60	1.70	1.70	1.27	1.55	1.40	1.21	1.68	1.15	1.15	3.56	5.88	3.25	2.65	3.75
May	1.69	1.60	1.60	1.60	1.60	1.60	1.60	1.70	1.70	1.29	1.51	1.39	1.25	1.60	1.12	1.15	3.75	6.60	2.25	2.65	3.75
June	1.39	1.60	1.69	1.60	1.60	1.60	1.60	1.70	1.62	1.25	1.48	1.35	1.25	1.45	1.10	1.16	3.63	8.00	3.25	2.65	3.55
July	1.16	1.60	1.75	1.60	1.60	1.60	1.60	1.70	1.60	1.33	1.41	1.35	1.30	1.45	1.10	1.22	3.44	9.00	3.25	2.65	3.38
August	1.09	1.60	1.75	1.60	1.60	1.60	1.60	1.70	1.60	1.40	1.40	1.34	1.35	1.44	1.18	1.26	3.70	8.80	3.25	2.65	3.25
September	1.11	1.60	1.75	1.60	1.44	1.60	1.60	1.70	1.60	1.46	1.40	1.29	1.47	1.40	1.20	1.34	4.00	8.00	3.25	2.53	3.25
October	1.07	1.60	1.84	1.60	1.40	1.60	1.60	1.70	1.60	1.50	1.40	1.17	1.53	1.36	1.14	1.44	4.00	3.25	3.25	2.61	3.09
November	1.31	1.60	1.82	1.60	1.40	1.60	1.62	1.70	1.60	1.54	1.40	1.13	1.59	1.26	1.08	1.65	4.15	3.25	3.25	2.65	2.81
December	1.39	1.60	1.82	1.60	1.45	1.60	1.70	1.70	1.60	1.55	1.40	1.15	1.60	1.20	1.05	2.04	4.25	3.25	3.13	2.65	2.65

Beams at Pittsburgh, Cents per Pound

January	2.25	1.50	1.60	1.80	1.60	1.50	1.70	1.70	1.70	1.60	1.55	1.40	1.15	1.75	1.20	1.10	1.90	3.25	3.00	2.80	2.47
February	2.25	1.50	1.60	1.60	1.60	1.50	1.70	1.70	1.70	1.52	1.51	1.40	1.11	1.71	1.20	1.10	2.06	3.25	3.00	2.80	2.70
March	2.25	1.52	1.70	1.60	1.60	1.60	1.70	1.70	1.70	1.30	1.50	1.40	1.15	1.70	1.19	1.10	2.40	3.54	3.00	2.71	3.13
April	2.25	1.60	1.70	1.60	1.60	1.60	1.70	1.70	1.70	1.27	1.50	1.40	1.21	1.68	1.15	1.20	2.55	3.88	3.00	2.45	3.25
May	2.25	1.60	1.60	1.60	1.60	1.60	1.70	1.70	1.70	1.27	1.50	1.39	1.25	1.50	1.14	1.20	2.60	4.00	3.00	2.45	3.10
June	2.07	1.60	1.60	1.60	1.60	1.60	1.70	1.70	1.62	1.25	1.48	1.35	1.25	1.45	1.11	1.20	2.53	4.31	3.00	2.43	3.10
July	1.90	1.60	1.84	1.60	1.60	1.60	1.70	1.70	1.60	1.33	1.41	1.35	1.30	1.45	1.12	1.25	2.50	4.50	3.00	2.45	3.10
August	1.74	1.60	2.00	1.60	1.60	1.63	1.70	1.70	1.60	1.40	1.40	1.35	1.35	1.45	1.19	1.30	2.52	4.30	3.00	2.43	3.10
September	1.50	1.60	2.00	1.60	1.44	1.70	1.70	1.70	1.60	1.46	1.40	1.34	1.42	1.41	1.20	1.35	2.64	4.00	3.00	2.43	3.10
October	1.50	1.60	2.07	1.60	1.40	1.70	1.70	1.70	1.60	1.50	1.40	1.21	1.48	1.37	1.15	1.44	2.75	3.00	3.00	2.45	3.05
November	1.50	1.60	2.05	1.60	1.40	1.70	1.70	1.70	1.60	1.54	1.40	1.13	1.57	1.29	1.10	1.60	2.86	3.00	3.00	2.45	2.89
December	1.50	1.60	2.00	1.60	1.44	1.70	1.70	1.70	1.60	1.55	1.40	1.15	1.60	1.25	1.07	1.78	3.25	3.00	2.90	2.45	2.45

Wire Nails at Pittsburgh, Dollars per Keg of 100 Lb.

January	$3.20	$2.22	$1.99	$1.89	$1.89	$1.75	$1.85	$2.00	$2.05	$1.95	$1.85	$1.71	$1.57	$1.75	$1.54	$1.54	$2.13	$3.00	$3.50	$3.50	$4.50
February	3.20	2.30	2.05	1.92	1.90	1.80	1.85	2.00	2.05	1.95	1.85	1.75	1.60	1.75	1.60	1.57	2.25	3.00	3.50	3.50	4.50
March	3.20	2.30	2.05	2.00	1.91	1.80	1.85	2.00	2.05	1.95	1.85	1.79	1.60	1.76	1.60	1.60	2.40	3.20	3.50	3.44	4.00
April	2.95	2.30	2.05	2.00	1.90	1.80	1.85	2.00	2.05	1.87	1.85	1.80	1.60	1.80	1.60	1.56	2.40	3.28	3.50	3.25	4.00
May	2.20	2.30	2.05	2.00	1.90	1.80	1.85	2.00	2.05	1.65	1.82	1.80	1.60	1.80	1.56	1.55	2.50	3.50	3.50	3.25	4.00
June	2.20	2.30	2.05	2.00	1.90	1.74	1.85	2.00	1.97	1.70	1.80	1.75	1.60	1.80	1.50	1.55	2.50	3.75	3.50	3.25	4.00
July	2.20	2.30	2.05	2.00	1.89	1.70	1.84	2.00	1.95	1.72	1.75	1.70	1.62	1.70	1.52	1.60	2.50	4.00	3.50	3.25	4.00
August	2.20	2.30	2.05	2.00	1.71	1.70	1.82	2.00	1.95	1.80	1.70	1.69	1.66	1.65	1.56	1.61	2.58	4.00	3.50	3.25	4.25
September	2.20	2.30	2.03	2.00	1.60	1.74	1.86	2.05	1.95	1.80	1.70	1.65	1.70	1.65	1.60	1.60	2.60	4.00	3.50	3.25	4.25
October	2.20	2.28	1.89	2.00	1.60	1.80	1.85	2.05	1.95	1.80	1.70	1.64	1.70	1.63	1.60	1.80	2.63	....	3.50	3.31	4.25
November	2.20	2.17	1.85	1.97	1.62	1.80	1.88	2.05	1.95	1.80	1.70	1.55	1.70	1.59	1.50	1.87	2.85	3.50	3.50	3.50	4.05
December	2.20	1.99	1.85	1.87	1.73	1.80	2.00	2.05	1.95	1.85	1.70	1.53	1.72	1.55	1.51	2.04	3.00	3.50	3.50	4.12	3.25

Bessemer Steel Rails at Mill, Dollars per Gross Ton

	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$35.00	$26.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$38.00	$55.00	$55.00	$45.00
February	34.00	26.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	38.00	55.00	55.00	45.00
March	35.00	26.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	38.00	55.00	52.50	47.50
April	35.00	27 30	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	38.00	55.00	45.00	55.00
May	35.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	33.00	38.00	55.00	45.00	55.00
June	35.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28 00	28.00	28.00	28.00	28.00	28.00	28.00	33.00	38.00	55.00	45.00	55.00
July	35.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	33.00	38.00	55.00	45.00	55.00
August	35.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28 00	28.00	28.00	33.00	38.00	55.00	45.00	55.00
September	32.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	33.00	38.00	55.00	45.00	55.00
October	26.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	33.00	.....	55.00	45.00	55.00
November	26.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	36.00	.....	55.00	45.00	55.00
December	26.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	38.00	.....	55.00	45.00	51.00

In plotting the lines on the accompanying chart, those representing finished material have been derived by multiplying the market prices of finished material per pound by 2240. In the tables, however, while pig-iron and steel-billet prices are in dollars per gross ton, those that are given for finished material are in cents per pound.

Prices used in plotting the charts are for delivery in from one to three months, and thus do not represent the extreme prices paid at times for prompt delivery.

prices than ruled in 1920. There is plenty of coal for the steel companies with by-product plants at the lowest prices that have prevailed since the period of depression which followed the signing of the armistice. Merchant producers of pig iron start the New Year with very slim order books and showing no inclination to go high for fuel and the position of the foundries is relatively as bad. It is probable that wage reductions in industry will be followed in the coal mines, though in union districts this may be slow in coming because the present wage agreement still has more than 12 months to run.

Connellsville Coke Prices for Eighteen Years

We present below tables showing monthly prices of prompt shipment Connellsville furnace and foundry coke for 18 years, 1903 to 1920, inclusive, averaged from weekly quotations in THE IRON AGE.

Average Prices of Prompt Connellsville Furnace Coke, per Net Ton at Oven

	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$5.00	$1.60	$2.46	$2.62	$3.53	$1.92	$1.59	$2.55	$1.40	$1.82	$3.88	$1.85	$1.50	$2.94	$9.50	$6.00	$5.65	$6.00
February	5.00	1.52	2.56	2.14	3.50	1.86	1.59	2.12	1.45	1.78	2.52	1.85	1.50	3.38	9.62	6.00	4.44	6.00
March	5.00	1.65	2.43	2.24	3.02	1.72	1.60	2.00	1.55	2.12	2.40	1.90	1.50	3.47	9.60	6.00	4.06	6.00
April	4.20	1.60	2.07	2.45	2.72	1.57	1.60	1.77	1.59	2.39	2.15	1.86	1.50	2.41	7.38	6.00	3.65	9.60
May	3.50	1.50	1.87	2.46	2.16	1.50	1.57	1.66	1.50	2.28	2.13	1.77	1.50	2.30	7.80	6.00	3.69	12.00
June	3.00	1.45	1.82	2.32	1.89	1.55	1.52	1.65	1.42	2.02	2.11	1.75	1.56	2.49	11.25	6.00	4.00	15.00
July	2.50	1.45	1.81	2.51	2.40	1.57	1.58	1.59	1.44	2.21	2.45	1.75	1.64	2.75	12.75	6.00	4.07	17.20
August	2.25	1.45	1.80	2.76	2.62	1.50	1.66	1.57	1.46	2.21	2.50	1.70	1.50	2.80	13.60	6.00	4.31	17.75
September	2.20	1.45	2.10	2.85	2.82	1.50	2.39	1.60	1.50	2.37	2.29	1.65	1.61	2.94	11.12	6.00	4.56	16.70
October	1.90	1.47	2.61	2.84	2.85	1.53	2.76	1.59	1.50	3.41	2.98	1.60	2.03	4.88	6.00	6.00	4.52	15.12
November	1.75	2.04	2.95	3.13	2.41	1.72	2.74	1.50	1.52	3.94	1.82	1.52	2.28	6.90	6.00	6.00	5.87	8.255
December	1.62	2.12	2.79	3.52	2.06	1.82	2.67	1.44	1.60	4.00	1.75	1.50	2.64	8.38	6.00	6.00	6.12	6.20

Average Prices of Prompt Connellsville Foundry Coke, per Net Ton at Oven

	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$6.50	$2.18	$2.38	$3.43	$4.25	$2.45	$2.00	$2.90	$1.90	$1.97	$4.40	$2.50	$2.00	$3.50	$9.75	$7.00	$6.25	$7.00
February	6.50	2.10	2.68	2.65	4.00	2.39	1.95	2.70	2.10	2.09	3.25	2.50	2.00	3.50	11.00	7.00	5.00	7.00
March	6.50	2.25	2.75	2.78	3.65	2.25	1.95	2.60	2.05	2.56	3.00	2.45	2.00	3.73	11.60	7.00	4.94	7.00
April	5.50	2.15	2.70	2.95	3.31	2.22	1.86	2.45	2.00	2.69	3.00	2.40	2.00	3.56	9.13	7.00	4.20	10.20
May	4.50	2.00	2.55	2.81	3.00	2.03	1.85	2.20	1.81	2.58	2.85	2.40	2.00	3.25	8.90	7.00	4.31	13.00
June	3.50	1.90	2.40	2.65	3.00	2.00	1.80	2.17	1.76	2.40	2.80	2.32	2.00	3.25	11.72	7.00	4.56	15.75
July	3.25	1.80	2.35	2.79	3.00	2.00	2.00	2.15	1.82	2.40	2.70	2.23	2.05	3.25	13.25	7.00	5.00	17.80
August	3.00	1.75	2.25	3.00	3.08	1.92	1.95	2.15	1.85	2.40	2.90	2.25	2.00	3.30	13.20	7.00	5.25	18.875
September	2.87	1.85	2.50	3.19	3.20	1.90	2.55	2.12	1.85	2.54	2.90	2.10	2.07	3.31	11.75	7.00	5.80	17.70
October	2.87	2.00	3.00	3.31	3.25	2.10	2.90	2.10	1.81	3.65	2.81	2.00	2.35	3.88	6.00	7.00	6.25	16.375
November	2.50	2.25	3.50	4.00	2.75	2.20	3.25	2.05	1.85	4.25	2.60	1.92	2.88	7.10	7.00	7.00	7.00	9.50
December	2.25	2.35	3.50	4.12	2.50	2.25	3.20	1.97	1.90	4.50	2.50	1.90	2.95	8.63	7.00	7.00	7.00	7.00

Wire Rod Prices at Pittsburgh for Eighteen Years

Quotations on wire rods did not regularly appear in market reports until late in 1901. Prices below are for Bessemer wire rods, per gross ton, at Pittsburgh, averaged from weekly quotations in THE IRON AGE. The quotations for November and December, 1917, and all of 1918, are Government prices and apply also to open-hearth rods.

	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
anuary	$34.70	$30.00	$31.00	$33.75	$37.00	$34.30	$33.00	$33.00	$28.00	$24.37	$30.00	$25.50	$25.00	$43.00	$75.00	$57.00	$57.00	$60.00
February	35.75	30.00	31.00	34.00	37.00	35.00	33.00	33.00	28.75	25.00	30.00	26.38	25.00	48.00	77.50	57.00	57.00	63.75
March	36.62	30.80	31.70	34.00	37.00	35.00	33.00	33.00	29.00	25.00	30.00	26.50	25.00	54.80	81.00	57.00	55.75	70.00
April	37.00	31.00	34.00	34.12	37.00	35.00	29.00	32.50	29.00	25.00	30.00	26.00	25.00	60.00	85.00	57.00	52.00	70.00
May	37.00	30.50	34.00	34.40	37.00	35.00	27.50	32.00	29.00	25.00	30.00	25.50	25.00	60.00	86.00	57.00	52.00	72.50
June	36.62	29.20	33.30	34.00	37.12	33.50	27.50	30.80	28.25	25.00	29.50	24.50	25.00	53.75	92.50	57.00	52.00	75.00
July	35.80	28.00	31.87	34.00	36.50	33.00	29.40	29.25	27.00	25.00	28.30	24.50	25.63	53.75	96.25	57.00	52.00	75.00
August	35.00	28.00	32.10	34.00	36.10	33.25	31.00	28.25	27.00	25.80	28.00	25.00	27.00	55.00	94.00	57.00	52.00	75.00
September	34.75	27.00	31.12	34.00	36.00	33.00	31.50	28.00	27.00	27.00	27.37	26.20	29.40	55.00	88.75	57.00	52.00	75.00
October	34.00	26.00	31.75	34.50	35.40	33.00	31.87	28.50	26.00	28.50	26.60	25.88	31.75	55.00	77.25	57.00	52.00	75.00
November	31.62	26.75	32.10	35.50	34.00	33.00	32.50	28.12	25.30	29.75	25.87	25.25	36.25	63.00	57.00	57.00	54.50	66.40
December	30.50	29.80	32.50	37.00	34.00	33.00	33.00	28.00	24.50	30.00	25.17	25.00	39.50	68.75	57.00	57.00	59.50	57.00

A Variable Year in the Cast-Iron Pipe Industry

Prices Rise Rapidly and Fall Suddenly—Labor Conditions an Important Feature of the Year

THE year 1920 has been one of extremes. Prices rose gradually, but dropped suddenly and drastically; at one time foundries were glutted with orders, while later many shut down entirely because of lack of business; for a while there was a great scarcity of labor, but at another time large numbers were released. The year has illustrated the expression, "either a feast or a famine." Notwithstanding these troubles, as well as embargoes and freight increases, the year has been satisfactory.

In spite of price vicissitudes, the level at the end of 1920 is practically the same as the year before, pipe being $1 higher in New York and but $2.70 in Chicago, these differences, however, practically coinciding with the increase in freight rates in August, thereby making the price, f.o.b. at mills, the same for both year ends. Prices had reached their highest peak during the middle of September, when they were: New York, $77.22; Birmingham, $78; Chicago, $83.10, all for 6-in. sizes. The drastic cuts took place in December when a leading maker in the New York district lowered his price $14 a ton, followed soon by a $19 reduction at Chicago by the United States Cast Iron Pipe & Foundry Co.

That the high prices of cast-iron pipe were justified is proven by the following figures compiled from the accompanying tables of prices of gray forge pig iron, Philadelphia, and cast-iron pipe, New York. The difference between the highest and the lowest average quotations for pig iron is $8.36, which represents a maximum increase of 21.58 per cent. A similar difference in pipe prices amounts to $10.92, or a maximum increase of 16.47 per cent. Therefore, it is seen that the increase in pipe was practically the same as that of the principal material used in its manufacture, or, to be exact, but $2.56 more than that for this raw material. The increased cost of labor, fuel, transportation and scrap was an important factor. Extras for Class A and gas pipe were changed from $2 to $4, in Chicago in September and in New York in December. Simultaneously, in Chicago the differential between 6-in. and 4-in. pipe was raised from $3 to $5.

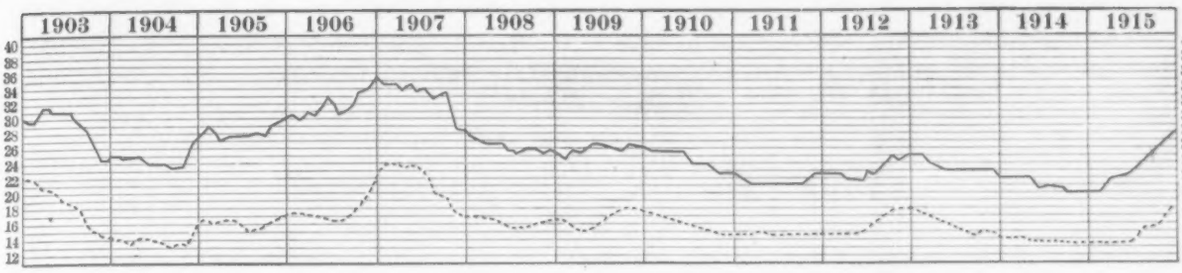
Business proceeded at almost unprecedented bounds for the first half of the year. Birmingham reported in January that the trade was "swamped with orders"; that sanitary shops absolutely refused new orders; that bookings of flange pipe for Texas oil fields could not be guaranteed under six months. As late as the last of April it was reported from the New York district that

Billet Prices at Pittsburgh for Thirty-two Years

The table below gives the average monthly prices of 4 x 4 in. Bessemer steel billets at Pittsburgh from 1889 to 1920, inclusive. The prices are per gross ton and are averaged from weekly quotations in THE IRON AGE. Prior to 1886 steel billets were not a regular merchant commodity.

	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904
January	$28.15	$36.65	$25.60	$25.00	$21.56	$16.12	$14.90	$16.80	$15.42	$14.93	$16.62	$34.50	$19.75	$27.50	$29.60	$23.00
February	27.81	35.25	26.00	24.36	21.62	15.75	14.95	17.38	15.25	15.06	18.00	34.87	20.31	29.37	29.87	23.00
March	27.25	31.88	26.25	23.00	22.60	15.55	14.84	17.09	15.44	15.25	24.30	33.00	22.88	31.25	30.62	23.00
April	27.00	28.38	25.35	22.81	22.44	15.69	15.44	19.53	14.60	15.06	25.37	32.00	24.00	31.50	30.25	23.00
May	26.90	27.55	25.50	22.41	21.69	18.00	16.30	19.50	13.82	14.85	26.75	28.90	24.00	32.27	30.37	23.00
June	26.75	30.25	25.25	22.97	21.70	18.12	18.63	19.12	14.06	14.65	30.10	27.25	24.38	32.35	28.87	23.00
July	27.13	30.70	25.50	23.50	21.06	18.00	20.75	18.85	14.00	14.50	33.12	21.00	24.00	31.76	27.60	23.00
August	28.20	30.38	25.31	23.81	20.45	17.15	21.75	18.75	14.00	15.85	35.40	18.20	24.20	31.02	27.00	23.00
September	29.50	30.13	25.00	23.65	19.31	17.19	24.00	19.75	15.60	16.00	38.37	16.93	24.88	29.50	27.00	20.00
October	33.70	28.70	24.90	23.53	18.06	16.00	21.90	19.75	16.44	15.56	38.75	16.50	26.70	29.70	27.00	19.50
November	34.00	27.39	24.16	24.94	17.37	15.57	19.13	20.00	15.57	15.06	36.50	18.95	27.00	28.50	24.00	20.25
December	35.60	26.25	24.20	22.40	16.69	15.12	16.97	17.50	15.00	15.80	33.75	19.75	27.50	29.10	23.00	21.20

	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$22.75	$26.25	$29.40	$28.00	$25.00	$27.50	$23.00	$20.00	$28.30	$20.13	$19.25	$32.00	$63.00	$47.50	$43.50	$48.00
February	23.50	26.50	29.50	28.00	25.00	27.50	23.00	20.00	28.50	21.00	19.50	33.50	65.00	47.50	43.50	55.25
March	24.00	26.70	29.00	28.00	23.00	27.50	23.00	19.75	28.50	21.00	19.70	42.40	66.25	47.50	42.25	60.00
April	24.00	27.00	30.12	28.00	23.00	26.75	23.00	20.00	28.50	20.80	20.00	43.00	73.75	47.50	38.50	60.00
May	23.50	26.40	30.30	28.00	23.00	26.12	22.60	20.80	27.60	20.00	20.00	45.00	86.00	47.50	38.50	60.00
June	22.00	26.63	29.62	25.75	23.00	25.30	21.00	20.87	26.50	19.50	20.50	43.50	98.75	47.50	38.50	61.00
July	22.00	27.25	30.00	25.00	23.50	25.00	21.00	21.50	26.60	19.00	21.38	41.00	100.00	47.50	38.50	62.50
August	24.00	27.80	29.25	25.00	24.13	24.62	21.00	22.12	26.00	20.25	23.13	44.20	86.00	47.50	38.50	61.00
September	25.00	28.00	29.37	25.00	25.00	24.40	20.75	23.62	24.87	21.00	24.10	45.00	66.25	47.50	38.50	58.74
October	25.62	28.00	28.20	25.00	26.25	23.75	20.00	26.00	23.30	20.00	24.63	46.25	49.38	47.50	38.50	55.00
November	26.00	28.88	28.00	25.00	27.13	23.30	19.50	27.00	21.00	19.25	26.50	52.00	47.50	47.50	38.87	49.70
December	26.00	29.50	28.00	25.00	27.50	23.00	19.25	27.00	20.00	19.00	30.25	57.50	47.50	45.50	46.00	43.50



The Fluctuation of Prices of 6-In. Cast Iron Water Pipe at New York, Per Net Ton, Car Load Lots, from 1903 to 1915, Compared with Gray Forge Pig Iron at Philadelphia. Solid line, pipe; dotted, pig iron

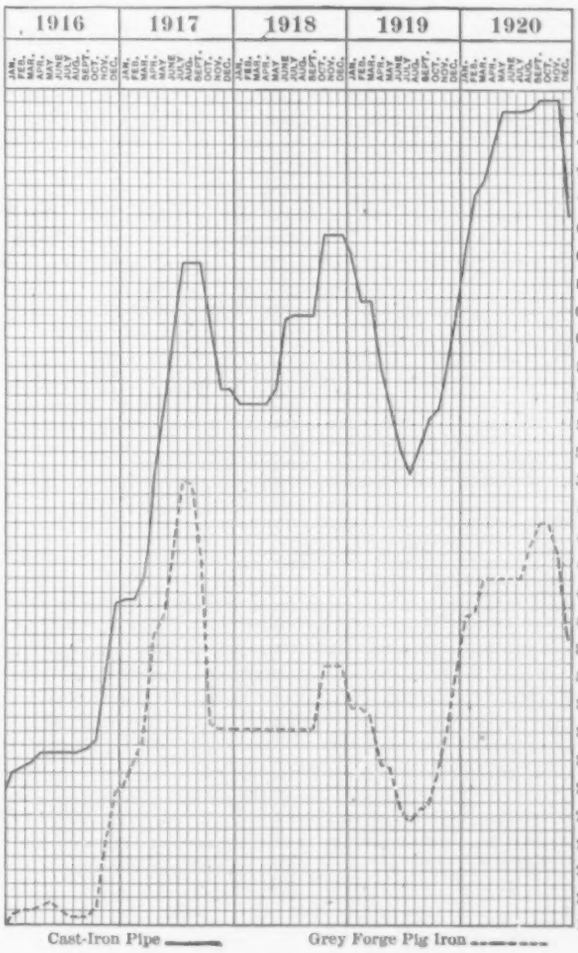
the series of price raises had not curbed orders and that makers were booked for three or four months in advance. Chicago was hit first by the slump, apparently at the end of March. In spite of lessened demand prices were raised in series until the middle of September. Toward the close of the year many pipe shops closed either in part or in whole, though in many cases this was welcomed, as it gave the opportunity of overhauling, made necessary by the previous vigorous production.

During the rush period labor was the great problem. It had proven difficult to hold labor in the more attrac-

Cast-Iron Pipe Prices at New York, 6-Inch, per Net Ton

	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910
Jan.	$21.75	$24.50	$29.25	$24.50	$28.00	$29.75	$34.25	$27.00	$24.50	$25.50
Feb.	22.25	25.00	29.25	24.25	28.50	29.50	34.25	26.75	24.25	25.50
March	21.50	26.25	30.75	24.25	26.75	30.50	34.00	26.25	25.25	25.50
April	22.00	26.00	31.00	24.25	27.00	29.75	33.50	26.25	25.00	25.50
May	22.25	27.75	30.75	24.00	27.25	31.00	34.25	26.25	25.25	25.50
June	23.00	28.00	30.75	23.50	27.25	32.50	33.50	25.75	26.00	25.25
July	23.75	28.50	30.75	23.50	27.25	30.25	34.00	25.75	26.25	24.00
Aug.	23.75	29.50	29.50	23.50	27.75	30.50	32.50	25.25	26.00	23.50
Sept.	23.50	29.50	29.00	23.00	27.25	31.00	33.00	25.75	25.75	23.50
Oct.	24.00	29.50	26.00	23.25	28.25	33.00	33.50	25.75	25.50	23.00
Nov.	24.50	30.75	24.50	25.00	29.00	33.25	28.50	25.00	25.87	22.12
Dec.	23.75	29.25	24.25	27.00	29.25	35.50	28.00	25.50	25.70	22.00

	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
Jan.	$22.00	$22.00	$25.00	$22.00	$20.00	$29.00	$41.50	$55.35	$65.70	$66.30
Feb.	21.50	22.00	24.75	22.00	20.00	29.33	41.50	55.35	62.70	70.30
March	21.00	22.00	23.87	22.00	20.00	29.75	43.10	55.35	62.70	71.30
April	21.00	21.25	23.50	22.00	21.60	30.50	50.88	55.35	57.70	73.90
May	21.00	21.00	23.00	20.88	22.00	30.50	55.50	56.60	54.45	76.30
June	21.00	21.00	23.00	20.50	22.25	30.50	60.75	61.44	52.03	76.30
July	21.00	22.10	23.00	20.50	22.50	30.50	65.50	61.75	50.46	76.30
Aug.	21.00	22.00	23.00	20.50	23.25	30.50	65.50	61.75	52.33	76.53
Sept.	21.00	23.12	23.00	20.40	24.37	30.83	65.50	61.75	54.30	77.22
Oct.	21.00	24.50	23.00	20.00	25.25	31.50	61.00	67.70	55.30	77.22
Nov.	21.40	24.12	23.00	20.00	26.50	35.50	56.50	67.70	58.30	77.22
Dec.	22.00	24.62	22.33	20.00	27.60	41.00	56.50	67.70	61.30	68.87



Detail Diagram of Course of Cast-Iron Pipe and Gray Forge Iron Prices in Past Five Years

tive industries, but becaues of the dirt, danger and hard work of a pipe foundry, it was unusually trying to keep the forces intact. Employers made work as attractive as possible, some paying by piece, thereby allowing men to quit work early in the afternoons. Some foundries worked at no more than 60 per cent capacity merely because of the lack of labor. As other lines of industry curtailed and many thousands of workmen were out of jobs, the supply for the foundries was better.

Embargoes affected the pipe industry in the same measure as other branches of iron and steel manufacturing. Some plants operated but four days a week as a result. Cancellations were less than in other industries, such as the automotive industry, for two possible reasons: Water and gas pipe are a stern necessity; much of the manufacturers' business is with municipalities which are more prone to consider contracts inviolable.

Export business did not develop to any considerable extent because increasing prices were added to a bad exchange situation. However, considerable material was shipped to Cuba and South America. Many shipments were made by Southern makers to the Pacific Coast through Mobile and the Panama Canal.

A development of more than local interest to New Yorkers was the revelations of the Lockwood investigating committee, appointed by the State of New

Gray Forge Pig Iron, Philadelphia and Vicinity, Gross Ton

	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$14.50	$15.75	$21.75	$13.50	$16.25	$16.75	$23.50	$16.50	$16.25	$17.25	$14.25	$14.25	$17.65	$14.00	$13.50	$18.44	$28.38	$32.00	$33.90	$40.23
February	14.50	15.75	21.25	13.50	15.75	17.00	23.50	16.50	16.25	17.50	14.25	14.25	17.31	14.00	13.44	19.00	29.75	32.00	33.90	40.50
March	14.00	17.50	20.00	12.75	16.25	16.75	23.50	16.50	15.50	16.90	14.60	14.25	16.87	14.00	13.25	19.00	31.94	32.00	32.84	43.00
April	14.37	18.25	20.00	13.75	16.25	16.75	23.00	16.00	15.00	16.62	14.75	14.37	16.56	14.00	13.25	19.13	38.50	32.00	29.65	43.00
May	14.37	19.00	19.50	13.75	16.00	16.50	23.25	16.00	15.00	16.00	14.70	14.50	15.81	13.81	13.25	19.50	40.40	32.00	29.21	43.00
June	14.37	19.25	18.25	13.50	15.75	16.25	23.00	15.25	15.25	15.65	14.50	14.62	15.37	13.75	13.25	19.25	44.31	32.00	26.25	43.00
July	14.12	21.75	18.12	13.25	14.50	16.10	22.50	15.25	15.50	15.37	14.50	14.87	14.95	13.75	13.25	18.50	50.05	32.00	25.92	43.00
August	14.00	21.00	15.50	12.50	15.00	16.50	20.50	15.25	16.25	15.00	14.30	15.37	14.62	13.75	14.50	18.50	49.56	32.00	26.60	45.46
September	14.00	21.00	14.75	13.00	15.00	17.75	19.50	15.50	17.00	14.75	14.45	15.87	14.86	13.75	15.13	18.50	44.25	32.00	27.00	47.10
October	14.12	21.00	14.50	12.75	15.75	18.25	18.75	15.50	17.50	14.50	14.25	16.87	15.00	13.62	15.25	19.35	32.20	36.60	28.69	47.10
November	14.37	22.00	14.00	14.00	16.25	20.00	17.00	15.75	18.00	14.37	14.25	17.62	14.75	13.50	16.05	23.75	32.00	36.60	32.40	44.64
December	14.87	22.25	14.00	15.50	16.50	22.00	16.75	16.00	18.00	14.25	14.25	17.75	14.58	13.50	17.63	27.69	32.00	36.90	36.10	38.74

York to ascertain and remedy high costs of house building. An exposure was made of the Eastern Soil Pipe Manufacturers' Association and the Southern Soil Pipe Association, the former association including 10 manufacturers and the latter seven. The latter had already dissolved at the time of the investigation, while the former promised to dissolve as a result of the court proceedings. It was charged that these organizations had systems of price-fixing which tended to keep prices on a high level.

Shortage of Wire Products

Effects of Strike of Steel Workers in 1919 Felt in 1920—Adoption of New Extras

MOST of 1920 saw a pretty acute shortage of wire nails, and other common wire products were none too plenty until long after the general steel market began to feel the recession in general business. The explanation is to be found in the fact that the steel strike in 1919 cut deeper into the operation of wire mills than it did into the activities of most other kinds of finishing capacity. It will be recalled that the strike lasted longer in Cleveland, Youngstown, Johnstown, Monessen and Donora than it did in most other steel plant centers. In Cleveland and Donora are located important producing units of the American Steel & Wire Co., while Youngstown contains the Youngstown Sheet & Tube Co., a fairly large producer of nails and wire, and in Johnstown is the wire plant of the Midvale Steel & Ordnance Co. Monessen contains the plant of the Pittsburgh Steel Co., which ranks next to the American Steel & Wire Co. in the production of wire.

Even after the strike was over, there continued to be a shortage of skilled workmen and the orders which had piled up during the last quarter of 1919 became a lien upon early 1920 production, making it impossible for the larger companies to do much with new orders. Indeed, consumers found they could not obtain shipments against their old orders and it became necessary for them to seek needed supplies wherever they could be obtained. This led to the reopening of several old plants in various parts of the country, some of which had been idle as long as three and four years. They were idle because only on high selling prices could they be operated. High prices were obtainable, for the needs of nails were so large and insistent that buyers forgot costs in their efforts to secure supplies. This was true to only a slightly less degree of wire for manufacturing purposes, and for fencing. Sales of nails were made as high as $6.50 base per keg early in the year and some manufacturers reported having been offered orders carrying a price as high as $10 per keg from some especially needy buyers. A number of sales of plain wire were made as high as $6 per 100 lb., or exactly 100 per cent above the then nominal price of the American Steel & Wire Co.

Another factor in the failure of the production, at least, of nails to recover more rapidly from the strike curtailment was the strict adherence of the leading interests to a price of $3.25 base per keg, Pittsburgh, for that product. This company has capacity for producing as many nails as all other companies combined and the independents were not keen to produce nails to be sold in competition with the price of the American Steel & Wire Co., especially as they found their costs did not permit them to make and sell nails except at about $1 per keg above the base of that company. The card of extras for size which had been in effect since December, 1896, also worked a hardship on the independents and early in February they formulated a new one which more evenly distributed the burden of producing costs. This added about 22c. per keg to the average price of nails, but this was offset by a reduction of 25c. per keg in the base price, most independents marking down base price from $4.25 per keg to $4. The American Steel & Wire Co. did not immediately go along in this change, but in August did adopt the independent nail card. February also saw the adoption by independents of a new card of extras on cement coated nails and this was further revised in September. Extras on wire were revised in September by the independent companies. But the leading interest did not go along and at the end of the year the independents were back at the corporation base and using the old card.

For a long time, most of the leading makers followed a policy of replacement in regard to the acceptance of new orders; in other words, buyers merely were permitted to order to the extent of completed contracts. The turn in the market came about the beginning of the fourth quarter of the year. By this time

L. S. Charcoal Pig-Iron Prices for 28 Years

The following table, which has been compiled from quotations in THE IRON AGE, gives the average monthly prices of Lake Superior charcoal pig iron per gross ton, in carload lots, at Chicago, from 1893 to 1920:

	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906
January	$16.50	$15.50	$13.00	$14.50	$13.50	$12.50	$11.50	$25.50	$19.00	$19.25	$25.60	$16.62	$18.50	$20.40
February	16.50	15.40	13.00	14.00	13.50	11.50	12.50	25.50	17.50	20.25	26.50	15.87	18.50	20.13
March	16.50	15.25	13.00	13.50	13.50	11.50	15.75	25.50	17.50	20.65	26.50	15.00	18.50	19.75
April	16.50	15.25	12.75	13.50	13.50	11.50	17.00	25.50	18.00	21.50	25.30	15.19	18.50	19.44
May	16.50	15.25	13.00	13.50	13.00	11.50	17.25	24.50	17.50	22.80	24.12	15.00	17.75	19.05
June	16.00	15.25	13.00	13.50	13.00	11.50	19.50	23.00	17.00	23.50	24.00	14.70	17.00	19.00
July	16.00	15.00	13.50	13.50	13.00	11.50	21.50	22.00	17.00	25.00	22.20	14.50	16.50	19.06
August	16.00	14.50	13.50	13.50	13.00	11.50	22.50	20.00	17.00	25.75	20.62	14.87	16.40	19.35
September	16.00	14.25	14.50	13.50	12.50	11.50	24.25	18.50	17.00	26.00	19.00	14.75	16.87	20.13
October	16.00	14.00	15.50	13.50	12.50	11.50	25.00	18.00	17.00	26.00	18.10	15.31	18.25	21.50
November	15.75	13.50	15.50	13.50	12.50	11.50	25.50	17.00	17.50	26.00	17.12	16.37	19.20	24.63
December	15.50	13.00	16.00	13.50	12.50	11.50	25.50	18.25	18.00	25.25	16.50	17.80	20.00	26,13

	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$26.80	$22.50	$19.50	$19.50	$17.87	$16.00	$18.15	$15.25	$15.75	$19.50	$31.75	$37.50	$38.85	$48.75
February	27.00	21.38	19.50	19.50	17.50	15.95	18.00	15.25	15.75	19.75	33.75	37.50	38.85	58.38
March	26.75	21.25	19.50	19.30	17.50	15.75	18.00	15.25	15.75	19.75	36.75	37.50	38.85	58.20
April	26.50	20.30	19.50	19.00	17.50	15.75	18.00	15.45	15.75	19.75	40.25	37.50	38.85	57.25
May	27.40	20.00	19.50	18.62	17.25	15.75	18.00	15.75	15.75	19.75	48.15	37.50	38.85	57.50
June	27.50	20.00	19.50	18.50	16.80	16.75	16.81	15.75	15.75	19.75	52.88	37.62	38.85	57.50
July	27.00	20.00	19.50	18.50	16.50	16.25	15.65	15.75	15.75	19.75	57.75	38.00	31.75	57.50
August	27.20	19.50	19.50	18.50	16.50	16.25	14.69	15.75	16.00	19.75	58.00	38.00	32.25	57.70
September	27.00	19.50	19.50	18.40	16.50	17.12	15.25	15.75	15.85	19.75	58.00	38.00	32.75	58.50
October	26.20	19.50	19.50	18.12	16.50	18.65	15.25	15.75	15.75	20.25	37.50	38.00	33.44	58.50
November	25.12	19.50	19.50	18.00	16.50	18.65	15.25	15.75	17.00	26.46	37.50	38.70	38.50	55.75
December	24.25	19.50	19.50	18.00	16.37	18.75	15.25	15.75	18.65	31.75	37.50	38.70	43.00	.....

most makers had succeeded in catching up with their obligations, thanks to better mill operations, better shipments and a falling away in the demand, while the depression in the South incident to the slump in cotton brought a great many cancellations from that section. During the spring and summer, transportation conditions and the shortages of cars made it difficult for the mills to ship and there was free use of trucks in getting tonnages from the mills. This was notably the case in Pittsburgh and Chicago. The Jones & Laughlin Steel Co. cut its prices on wire products late in November to the Steel Corporation bases and other independents followed, though a few failed to go down to $3.25 for nails until the last week of the year. The slump in the automobile industry cost the wire makers a good many tonnages of spring wire for cushions. The end of the year found the market extremely quiet, with buyers evincing little interest and less than half of the independent capacity in operation.

Great Activity in Tubular Products

Highest Price in History for Oil Stimulates Wonderful Development of New Fields

LAST year was one of extreme activity in tubular goods, particularly in oil country pipe and prices to consumers became exorbitant. The desire to take advantage of the highest prices in history for oil stimulated to a high point the development of new fields and the price of pipe was of little or no importance to the oil producers so long as they could go ahead with their plans. Early in the year there was plenty of money for such work and even when the deflation of credits had begun to restrict other industries there still seemed to be funds for the prosecution of oil field development. The large loss of pipe production in the last quarter of 1919 was one result of the steel strike, which tied up the Wheeling and Youngstown districts tightly for a much longer period than it did several other steel centers. In Youngstown is the Youngstown Sheet & Tube Co., which ranks next to the National Tube Co. in point of production and that city also contains the Republic Iron & Steel Co., with an annual capacity of 228,000 tons, or about half that of the former company. In the Wheeling district are located LaBelle Iron Works and the Wheeling Steel & Iron

Pig Iron, Finished Material and Scrap, Chicago

The table below shows monthly prices of malleable pig iron at Chicago from 1903 to 1920, inclusive, averaged from weekly quotations in THE IRON AGE, in dollars per ton of 2240 lb.

Malleable Pig-Iron Prices, Chicago

	1903	1904	1905	1906	1907	*1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
Jan.	$23.24	$14.50	$17.50	$19.37	$26.00	$18.60	$17.09	$19.00	$15.50	$14.35	$17.90	$13.88	$13.00	$19.00	$30.94	$33.50	$31.50	$40.50
Feb.	23.00	14.50	17.50	19.19	26.00	18.25	16.75	19.00	15.50	14.14	17.31	13.94	13.00	19.00	31.75	33.50	31.50	42.75
March	22.87	14.00	17.50	19.00	26.25	17.50	16.50	18.40	15.50	14.00	17.25	14.25	13.00	19.40	35.40	33.50	30.44	43.50
April	21.82	14.00	17.50	18.77	26.50	17.50	16.50	17.50	15.25	14.00	17.05	14.25	13.00	19.50	39.00	33.50	27.25	43.50
May	20.77	14.00	17.37	18.35	26.60	17.56	16.66	17.06	15.00	14.40	16.00	14.06	13.00	19.50	43.60	33.50	27.25	43.50
June	19.50	13.85	16.65	18.00	26.25	17.37	16.50	16.75	15.00	14.50	15.62	13.88	13.00	19.50	50.25	33.50	27.25	43.50
July	18.66	13.75	16.37	18.37	25.62	17.50	16.90	16.56	15.00	14.50	14.65	14.00	13.00	19.50	55.00	33.50	27.25	45.25
Aug.	17.59	13.75	16.50	18.95	24.80	17.50	17.12	16.50	14.80	15.10	15.00	14.00	13.44	19.00	55.00	33.50	27.25	46.50
Sept	16.94	13.50	16.56	20.12	24.40	17.26	18.50	16.40	14.50	16.25	15.00	13.25	14.30	19.00	54.75	33.50	27.25	46.50
Oct	16.25	13.75	17.37	21.32	22.40	17.00	18.50	16.06	14.50	17.10	15.20	13.00	15.25	19.88	33.50	34.50	28.25	46.13
Nov	15.00	15.87	19.00	24.16	20.25	17.00	19.00	16.00	14.35	17.87	14.87	12.88	17.13	25.80	33.50	34.50	31.50	42.00
Dec.	14.50	16.50	19.50	26.00	18.75	17.00	19.00	16.00	14.35	18.00	14.63	12.90	18.20	29.50	33.50	34.50	39.50	.....

*From this time on the prices are given as at furnace near Chicago, and 35c. to 50c. per ton should be added to get the price delivered to Chicago foundries.

The table shows the course of prices of pig iron, finished iron and steel and old material in Chicago market in 1920, compiled from the weekly reports in THE IRON AGE:

Pig Iron, Finished Iron and Steel and Scrap, Chicago

	Northern Coke. No. 2	Lake Superior Charcoal	Southern Coke No. 2	Common Bar Iron, Cents	Soft Steel Bars, Cents	Structural Steel, Cents	Cast Borings, Net Ton	No. 1 Railroad Wrought, Net Ton	Heavy Cast Scrap, Net Ton	Heavy Melting Steel Scrap, Gross Ton	Old Steel Rails Rerolling Gross Ton
January	$40.00	$48.75	$44.25	3.24	2.96	2.72	$14.38	$26.00	$37.25	$24.50	$34.25
February	42.25	58.38	45.50	3.63	3.45	3.18	14.63	27.00	38.88	25.00	34.38
March	43.20	58.20	46.40	3.68	3.57	3.50	14.05	27.10	37.85	24.25	32.80
April	43.00	57.25	46.25	3.75	3.70	3.50	14.25	27.25	37.25	23.75	30.63
May	43.00	57.50	47.00	3.75	3.45	3.50	12.88	26.38	37.38	23.00	31.75
June	43.00	57.50	47.00	3.88	3.45	3.45	11.95	25.25	36.30	22.95	32.65
July	45.00	57.50	47.00	3.88	3.45	3.25	12.63	24.88	36.50	24.13	35.00
August	46.00	57.70	47.33	3.88	3.47	3.14	13.45	24.75	36.20	25.35	38.00
September	46.00	58.50	48.67	3.88	3.50	3.23	13.08	23.88	34.00	24.81	38.13
October	45.25	58.50	48.42	3.88	3.31	3.20	11.50	20.25	28.75	21.50	33.44
November	41.50	55.75	45.67	3.75	3.04	3.07	10.65	16.85	23.00	18.45	22.90
December	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Averages 1919	29.23	37.03	33.49	2.68	2.74	2.79	10.51	18.65	23.75	18.15	23.44
1918	33.25	37.88	37.75	3.50	3.08	3.18	15.94	29.77	27.71	28.81	33.71
1917	41.13	44.14	40.38	3.77	3.772	4.275	13.64	30.40	20.05	27.86	34.74
1916	20.25	21.33	19.85	2.31	2.94	2.83	6.98	17.16	13.10	16.68	18.59
1915	14.02	16.10	14.73	1.24	1.48	1.48	5.57	10.27	9.96	10.91	11.73
1914	13.60	15.60	14.46	1.06	1.32	1.34	4.61	8.66	9.70	9.37	10.96
1913	15.95	16.50	16.12	1.43	1.55	1.60	5.36	10.80	10.44	10.90	13.33
1912	15.32	16.77	16.11	1.32	1.42	1.46	6.67	12.54	12.29	12.12	14.19
1911	14.87	16.96	14.80	1.22	1.47	1.50	5.34	11.23	11.08	10.92	12.91
1910	17.10	18.67	16.30	1.45	1.62	1.66	5.50	12.99	13.32	13.43	16.34
1909	17.49	19.50	17.30	1.43	1.50	1.59	6.37	13.76	13.79	14.45	15.83
1908	17.57	20.24	16.76	1.56	1.66	1.82	5.37	12.45	12.69	12.45	14.40
1907	24.50	26.56	24.47	1.78	1.77	1.87	8.78	14.63	17.26	15.08	17.53
1906	20.43	20.72	19.44	1.71	1.68	1.86	8.69	15.62	14.55	14.74	17.15
1905	17.65	17.99	16.66	1.65	1.65	1.78	8.57	16.14	13.50	13.97	15.02
1904	14.37	15.50	15.92	1.41	1.50	1.71	4.72	12.45	10.95	10.72	12.54
1903	19.25	22.13	18.31	1.65	1.72	1.75	7.33	16.07	14.75	15.50	19.04
1902	20.86	23.50	20.10	1.71	1.73	1.75	8.89	19.68	15.03	17.37	23.35
1901	15.38	17.50	14.60	1.58	1.58	1.70	4.20	15.00	11.25	12.84	16.05
1900	19.47	22.00	18.35	1.75	1.75	2.00	6.65	15.00	11.00	12.84	15.50

Co., and also the Riverside works of the National Tube Co. The year opened, therefore, with makers committed over a long period and few of them in a position to give much attention to new demands.

Shipments Greatly Hampered

Transportation conditions seriously affected shipments over a great deal of the year and for a long time, because of the scarcity of open top cars, practically all makers were obliged to pile as much production as they were getting away from the mills. Well into the fall, the National Tube Co. had unshipped tonnages amounting to more than 150,000 tons and it was not until after the repeal of the Interstate Commerce Commission order giving priorities to the coal mines in the matter of supplies of open top cars that this and other companies succeeded in getting rid of their accumulations. The market assumed a somewhat quieter tone in the last month of the year, presumably because of the receipt by distributors of the large tonnages which they had been unable to obtain earlier in the year. Much pipe was moved by truck in the Pittsburgh and Youngstown districts and during the worst of the shortage in the car supply shipments by water were fairly common from Pittsburgh and Wheeling producers having access to the rivers. The National Tube Co. also moved much tonnage by lake from its Lorain, Ohio, works.

It shipped both to Chicago and to the East from this plant, tonnages going in the latter direction moving by boat to Buffalo and thence by the New York barge canal to the seaboard.

From early in the year, there was a spread of from $7 to $10 per ton between the prices of the National Tube Co. and those of the independent producers. The latter in January, 1920, raised standard pipe, both lapweld and buttweld, $7 per ton by cutting the base discount from 57½ per cent off list to 54 per cent off list and at the same time raised oil country pipe $10 per ton. The National Tube Co., in keeping with the Steel Corporation price policy, held to the March 21, 1919, base of 57½ per cent off list throughout the entire year. On the last day of the year the Republic Iron & Steel Co. announced that it had cut its pipe prices to the National Tube Co. bases, and this step was followed by most of the other independents.

Wrought iron pipe shared the prosperity of steel pipe and also profitted from the fact that supplies of steel pipe were not easy to obtain. The A. M. Byers Co. on May 1, 1920, issued a new card raising prices of buttweld pipe $20 per ton and on lapweld goods $16 per ton. The Reading Iron Co. failed to follow this advance immediately; in fact, it took no action until Dec. 15, when it issued a new card advancing buttweld sizes $18 per ton and lapweld pipe $15 per ton. The latter company was out of the market from about June 1 until Dec. 1, as its plant was idle during the period on account of labor troubles.

Non-Ferrous Markets Down to Pre-War Prices

Most Drastic Reductions in Years—Wild Speculation in Tin—High Quotation of Lead

ALL the non-ferrous metal markets experienced in 1920 the most drastic price declines recorded in several years. The falling off in consumption at the end of the year was also a feature, caused by the sudden readjustment in general business. Prices fell to levels much lower than any in 1919. In fact at the end of the year prevailing quotations were in all cases down to pre-war levels or lower. In nearly all markets, costs of production were generally higher than selling prices, due to high labor, increased freight rates, dear fuel and other causes. At the end of the war, production of copper, lead and zinc, particularly copper and zinc, had either been severely curtailed or preparations made to do so.

Copper Down to Pre-War Levels

By the end of 1920 the process of readjustment in the copper market, at least so far as prices were concerned, had been nearly completed. By that time values had fallen to the lowest levels, not only for the year but also for several years. In fact it is necessary to go back to 1914 to find levels lower than those ruling in December, 1920. Early in 1920 electrotytic copper was selling around 19c., New York, it touched 13.50c. by Dec. 1 and closed the year around 13c to 13.25c. Lake copper followed practically the same course.

Usually the progress of the copper market is characterized by periodic buying movements, appearing every few months. In 1920 this was true in the first half of the year, there having been two distinct movements of this kind, in January and in March. The railroad strike took place in April and this so upset industry in general that not until later in the year was any recovery apparent. Then came the increase in freight rates which was another retarding factor in the regular progress of business. This was followed by the rather sudden business depression so that buying of copper fell to the lowest volume of the year. This was aided by a cutting of prices among all classes of sellers, large and small, until its low values, in many cases under the cost of production, were reached in the closing weeks.

It was in this period that arrangements were made to reduce production but to what extent this was carried out will not be known until later. By the end of the year competition for business had subsided and the market, while not firm, was steady. Readjustment was generally regarded to have been overdone.

Heavy Melting Steel Scrap Prices, Pittsburgh

The appended table gives the average monthly prices of heavy melting steel scrap at Pittsburgh for 18 years, comprising 1903 to 1920, inclusive. These prices are in dollars per gross ton and are averaged from weekly quotations in the Pittsburgh iron market report of THE IRON AGE.

	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$21.20	$12.50	$16.25	$17.25	$18.95	$12.80	$16.63	$17.69	$13.50	$12.75	$14.95	$13.62	$11.63	$17.50	$22.60	$30.00	$19.00	$26.30
February	21.13	13.50	15.88	16.31	18.06	13.88	15.63	17.25	14.13	12.12	14.19	12.62	11.63	17.06	21.75	30.00	14.75	27.75
March	21.00	14.00	15.90	14.70	18.00	13.19	14.19	16.80	14.35	12.62	14.19	12.12	12.00	18.45	23.25	30.00	14.00	27.25
April	21.50	13.63	16.00	14.75	17.94	12.80	14.00	16.50	13.06	13.06	14.19	12.00	11.81	17.81	28.00	28.50	15.20	26.00
May	21.25	12.13	15.00	14.80	18.10	12.81	14.81	15.30	12.62	13.25	13.55	12.00	11.75	16.95	28.80	28.50	14.75	25.00
June	20.00	11.30	13.90	15.63	18.38	13.13	15.69	15.10	12.95	13.44	12.62	12.00	11.75	15.88	41.00	28.62	17.12	25.00
July	19.70	10.75	14.00	15.75	18.06	14.25	15.90	14.50	13.06	13.34	12.40	12.00	12.31	16.31	39.00	29.00	19.70	26.00
August	18.50	11.38	14.85	16.50	17.75	14.81	16.31	14.31	13.20	13.55	12.37	11.50	13.81	16.05	32.83	29.00	21.00	28.125
September	17.25	11.50	15.88	16.88	17.38	14.25	17.40	14.35	12.50	14.11	12.25	11.31	14.30	16.19	33.25	29.00	19.20	29.00
October	15.30	12.25	16.50	17.13	17.10	15.20	17.94	14.25	12.06	15.85	11.85	10.85	14.38	18.25	28.80	29.00	19.00	27.75
November	13.25	14.25	17.50	18.00	14.88	16.06	17.50	14.25	12.00	15.12	11.44	10.00	15.88	21.20	29.50	28.87	22.25	23.50
December	11.20	16.20	17.63	20.00	13.00	16.70	18.00	13.75	12.31	14.75	11.08	10.75	17.45	26.00	30.00	26.87	24.25	17.20

Foundry Iron Prices, Cincinnati and Chicago

The tables given below show the average monthly prices of No. 2 Southern pig iron at Cincinnati from 1880 to 1920, inclusive, and No. 2 local foundry pig iron at Chicago from 1889 to 1920.

Southern No. 2 Foundry Pig Iron at Cincinnati, per Gross Ton

	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892
January	$37.75	$22.50	$25.50	$21.62	$17.25	$15.62	$17.00	$20.12	$18.62	$14.75	$18.05	$13.81	$13.75
February	41.12	22.50	25.50	21.50	17.00	15.25	17.00	21.00	19.00	14.37	17.75	13.75	13.62
March	38.12	22.50	24.90	20.60	17.75	14.62	17.00	21.00	18.50	14.50	16.00	14.00	13.10
April	33.50	22.50	23.50	20.62	17.87	15.15	17.00	21.00	17.75	14.25	14.31	13.75	13.00
May	26.25	22.25	23.00	20.25	17.25	15.00	16.37	20.50	16.75	14.00	14.25	14.00	12.81
June	23.25	22.00	22.00	19.50	17.25	15.25	16.12	19.40	15.75	13.68	14.75	13.75	12.81
July	22.60	21.50	22.25	19.00	16.62	14.81	15.37	19.50	15.50	14.12	14.75	13.75	12.40
August	24.00	21.50	22.60	18.50	16.00	14.87	15.25	20.00	15.80	14.50	14.75	13.50	12.17
September	24.00	21.75	22.62	18.50	15.87	15.00	16.75	20.00	16.50	14.50	14.25	13.50	12.00
October	23.50	22.00	22.37	18.50	16.25	15.00	17.00	19.75	16.50	15.31	14.25	13.75	12.25
November	22.00	24.50	22.00	18.50	16.18	15.50	17.75	19.50	15.65	16.62	14.25	14.00	12.50
December	22.25	25.00	22.00	18.37	16.25	16.37	18.60	18.87	15.50	17.56	14.00	13.75	12.50

	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906
January	$12.50	$11.00	$9.25	$11.20	$11.00	$9.50	$10.31	$20.69	$13.45	$14.55	$21.65	$12.37	$16.25	$16.75
February	12.12	10.75	9.25	11.00	9.75	9.25	11.69	20.50	13.12	14.75	21.50	12.12	16.25	16.75
March	12.00	10.20	9.25	10.75	9.69	9.25	13.75	20.30	14.00	14.75	21.37	12.10	16.25	16.65
April	11.75	9.50	9.25	10.40	9.25	9.25	14.50	20.19	14.50	16.87	20.15	12.50	16.25	16.63
May	11.68	9.50	9.50	10.50	8.75	9.37	14.56	19.75	13.85	18.35	18.87	12.25	15.81	16.75
June	11.50	9.61	10.12	10.32	8.75	9.30	16.00	18.75	13.37	20.19	17.75	11.80	14.65	16.44
July	11.37	9.75	11.50	9.75	8.95	9.25	17.56	16.81	13.00	20.75	16.15	11.81	13.94	16.06
August	11.05	9.80	11.50	9.37	9.00	9.37	18.35	14.25	13.00	23.06	15.19	12.00	14.40	17.30
September	10.75	10.00	12.75	9.50	9.35	9.55	19.94	13.62	13.06	25.00	14.75	12.00	14.37	18.69
October	10.75	10.00	12.75	9.95	9.50	9.75	20.75	12.87	13.75	25.65	13.50	12.81	15.31	20.00
November	10.75	9.75	12.75	10.44	9.50	9.75	20.75	12.95	14.00	23.62	12.00	15.19	16.60	23.38
December	10.87	9.25	12.50	10.35	9.50	9.90	20.75	13.75	14.25	22.44	12.05	15.85	16.75	25.00

	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$26.00	$16.15	$16.25	$17.25	$14.25	$13.25	$16.95	$13.88	$12.40	$17.90	$26.10	$35.90	$34.60	$41.80
February	26.00	15.75	16.13	17.06	14.25	13.31	16.69	13.81	12.40	17.90	27.53	35.90	34.60	43.60
March	26.00	15.50	15.05	16.30	14.25	13.50	16.31	14.00	12.27	17.90	31.90	35.90	33.54	43.60
April	25.06	15.20	14.25	15.37	14.25	13.75	15.65	13.75	12.34	17.90	37.40	35.90	30.35	44.00
May	24.25	14.75	14.50	15.00	13.95	14.15	14.94	13.75	12.40	17.90	41.90	35.90	29.85	45.60
June	24.10	15.25	14.70	14.85	13.44	14.25	14.06	13.63	12.50	17.34	45.15	36.08	28.39	45.60
July	23.85	15.00	15.75	14.75	13.25	14.70	13.75	13.30	12.71	16.90	49.90	36.60	29.35	45.60
August	23.00	15.25	16.38	14.31	13.45	15.06	14.06	13.25	13.71	16.70	49.90	36.60	30.40	45.78
September	21.50	15.65	17.35	14.25	13.31	15.87	14.25	13.25	14.15	17.28	49.90	36.60	31.25	46.50
October	20.95	15.75	17.88	14.25	13.25	16.80	14.35	12.90	14.78	18.03	35.90	37.60	31.60	46.50
November	19.50	16.00	17.75	14.25	13.20	17.25	13.87	12.90	16.15	22.40	35.90	37.60	34.35	42.50
December	17.00	16.25	17.45	14.25	13.19	17.25	13.95	12.50	17.10	25.90	35.90	37.60	38.60	41.10

Local No. 2 Foundry Pig Iron at Chicago (at Furnace after 1907), per Gross Ton

	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904
January	$16.00	$19.50	$14.60	$14.50	$13.37	$12.50	$9.75	$13.55	$11.02	$11.35	$11.47	$23.85	$15.10	$16.25	$23.45	$14.47
February	15.00	18.87	15.00	14.37	12.81	11.87	9.75	12.50	11.00	11.28	12.47	23.85	14.60	16.85	23.35	13.91
March	15.00	17.62	15.00	14.00	13.00	11.30	9.81	12.00	10.88	11.10	14.95	23.85	15.60	18.51	23.22	14.05
April	15.00	16.62	15.12	14.00	13.00	10.50	10.25	12.00	10.75	11.26	15.47	23.72	15.85	18.97	22.87	14.35
May	15.00	16.20	15.00	14.00	12.96	10.50	10.25	11.69	10.38	11.35	15.72	22.65	15.85	20.85	20.72	13.85
June	14.50	16.00	15.00	14.00	13.00	10.50	10.88	11.50	10.25	11.35	17.95	20.72	15.35	21.85	19.85	13.70
July	14.87	16.00	15.15	14.00	12.79	10.12	12.13	11.25	10.25	11.35	19.22	18.60	15.35	21.60	18.25	13.60
August	15.10	16.00	15.00	13.75	12.75	10.00	13.20	11.18	10.25	11.35	20.65	16.25	15.35	22.10	17.22	13.60
September	15.50	16.00	15.00	13.50	12.75	10.00	13.63	10.75	10.40	11.35	22.22	15.35	15.35	23.35	16.41	13.85
October	17.00	16.00	15.00	13.50	12.75	10.00	14.00	10.88	11.00	11.35	23.35	14.85	15.10	23.35	15.70	14.10
November	17.62	15.75	14.94	13.50	12.75	9.70	14.00	11.19	11.00	11.35	23.45	14.85	15.23	23.35	15.10	15.98
December	18.66	15.37	14.62	13.50	11.69	9.75	14.00	11.25	11.00	11.35	23.85	15.10	15.85	23.35	14.81	16.95

	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$17.85	$19.60	$25.85	$18.45	$17.35	$19.00	$15.50	$14.00	$17.90	$13.80	$13.00	$18.50	$30.00	$33.00	$31.00	$40.00
February	17.85	19.41	25.85	18.16	16.75	19.00	15.50	14.00	17.31	14.00	13.00	18.50	31.25	33.00	31.00	42.25
March	17.80	19.35	26.10	17.85	16.50	18.30	15.50	14.00	17.25	14.25	12.95	18.70	35.40	33.00	29.94	43.00
April	17.60	19.10	26.35	17.73	16.50	17.50	15.00	14.00	17.06	14.25	13.00	19.00	39.25	33.00	26.75	43.00
May	17.60	18.90	26.85	17.63	16.50	17.06	15.00	14.50	16.15	14.06	13.00	19.00	43.80	33.00	26.75	43.00
June	17.00	18.54	26.60	17.73	16.50	16.75	15.00	14.50	15.63	13.69	13.00	19.00	50.37	33.00	26.75	43.40
July	16.47	18.60	25.55	17.55	17.00	16.56	14.87	14.70	14.70	13.75	13.00	19.00	55.00	33.00	26.75	45.25
August	16.60	19.45	24.85	17.35	17.13	16.50	14.50	15.37	15.00	13.69	13.44	18.40	55.00	33.00	26.75	46.00
September	16.60	20.16	24.10	17.05	18.70	16.40	14.50	16.00	15.00	13.31	13.90	18.13	54.50	33.00	26.75	46.00
October	17.66	21.48	22.45	16.85	19.00	16.00	14.46	17.00	15.00	12.94	14.63	19.63	33.00	34.00	27.75	44.50
November	19.15	24.70	20.66	17.10	19.00	16.00	14.09	17.75	14.88	12.56	17.13	25.80	33.00	34.00	31.00	39.40
December	19.60	25.85	18.80	17.35	19.00	16.00	14.00	18.00	14.50	12.90	18.10	29.50	33.00	34.00	38.75	34.50

The Cincinnati prices given above date back to the earliest period for which Southern pig-iron quotations are available at that point. It may be said that these quotations represent almost the beginning of the Northern business in pig iron coming from the vicinity of Birmingham, Ala.

The Chicago prices also represent quotations from the beginning of the production of pig iron in the vicinity of Chicago for the merchant trade. For a long time these prices were quoted delivered on track near Chicago foundries, but beginning in 1908 prices were figured at the furnace, from which at that time a switching charge to local foundries of about 35 cents per ton applied. At the present time the switching charge averages about 70 cents.

Mahoning and Shenango Foundry Iron Prices

In the following table are presented the monthly average prices of No. 2 foundry pig iron at Valley furnace, namely, at furnaces in the Mahoning Valley, Ohio, and the Shenango Valley, Pennsylvania, from 1903 to 1920, inclusive, averaged from weekly quotations in THE IRON AGE in dollars per ton of 2240 lb.

	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$22.30	$13.00	$16.12	$17.31	$24.60	$16.80	$15.44	$17.00	$13.75	$13.00	$17.50	$12.85	$13.00	$18.50	$31.00	$33.00	$31.00	$39.40
February	21.95	12.47	16.00	17.25	24.12	16.00	15.06	16.69	13.75	13.00	17.00	13.19	13.00	18.31	32.00	33.00	31.00	41.50
March	22.00	12.91	16.00	17.12	24.00	15.56	14.50	16.10	13.75	13.12	16.69	13.25	13.00	18.50	34.75	33.00	29.94	41.25
April	20.99	13.01	16.00	16.50	24.00	15.15	14.00	15.62	13.75	13.25	15.55	13.25	12.75	18.50	39.75	33.00	26.75	42.80
May	20.32	12.47	15.55	16.30	25.00	14.87	14.19	15.31	13.75	13.25	14.63	13.00	12.94	18.20	42.40	33.00	26.75	44.25
June	19.37	11.96	14.81	16.19	25.12	15.00	14.90	14.75	13.56	13.25	14.06	13.00	12.69	18.13	50.25	33.00	26.75	45.00
July	18.02	11.67	14.25	16.44	22.80	14.80	15.19	14.31	13.50	13.37	13.87	13.00	12.70	18.25	54.50	33.00	26.75	45.00
August	16.34	11.87	14.15	17.71	22.50	14.50	15.31	14.15	13.50	13.69	14.00	13.00	13.62	18.25	53.20	33.00	26.75	47.00
September	14.98	11.71	14.56	19.56	20.87	14.47	15.75	13.75	13.44	14.44	14.00	13.00	14.70	18.39	47.00	33.00	26.75	49.40
October	14.09	12.50	15.50	21.35	19.80	14.36	17.12	13.94	13.37	16.10	13.84	12.90	14.87	20.00	33.00	34.00	26.75	46.50
November	13.32	14.60	16.83	23.87	19.00	15.23	17.25	13.90	13.20	16.94	13.50	12.75	15.50	25.00	33.00	34.00	31.50	40.25
December	13.22	16.19	17.35	24.00	17.37	15.50	17.00	13.75	13.00	17.25	13.50	13.75	18.30	30.75	33.00	34.00	36.75	36.20

Metal, Tin Plate and Sheet Prices for Twenty-one Years

Monthly Averages Computed from the Weekly Market Quotations of "The Iron Age" in the Period of 1900-1920

(With Supplement)

THE accompanying supplement shows by plotted lines the fluctuations in prices of the more important metals, tin plate and sheets in the period from 1900 to 1920 inclusive. The prices used for this purpose are the computed monthly averages of the prices of carloads, at New York, for metals and at Pittsburgh for tin plate and No. 28 galvanized and black sheets, given in the metal market reports of THE IRON AGE week by week. The columns of figures alongside the chart give the values. The following tables give the monthly averages on which the chart is based, except for galvanized sheets, the table for which will be found on page 65.

Lake Copper, at New York, Cents per Pound

	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	†1914	†1915	†1916	†1917	1918	1919	1920
January	16.21	16.90	11.45	12.13	12.62	15.18	18.78	24.41	13.90	14.56	14.00	12.81	14.50	16.98	14.85	14.02	†24.39	†29.73	23.50	20.48	19.52
February	16.25	16.97	12.47	12.80	12.34	15.25	17.94	25.10	13.13	13.37	13.78	12.75	14.41	15.55	15.00	15.21	26.85	34.90	23.50	17.86	19.25½
March	16.41	17.00	12.12	14.31	12.60	15.25	18.50	23.38	12.85	12.90	13.75	12.58	14.88	15.05	14.79	15.75	27.10	35.85	23.50	15 46½	18.67
April	17.00	17.00	11.97	14.85	13.19	15.18	18.62	24.62	13.09	12.94	13.31	12.41	16.00	15.67	14.75	18.90	28.27	31.67	23.50	15.55	19.36
May	16.80	17.00	12.10	14.75	13.28	15.00	18.70	24.10	12.88	13.21	13.06	12.33	16.30	15.91	14.40	21.00	28.88	31.42	23.50	16.18	19.05
June	16.31	17.00	12.23	14.56	12.74	15.00	18.69	23.94	13.00	13.50	12.88	12.71	17.53	15.42	14.12	23.38	27.82	32.46	23.50	17.95	19.00
July	16.31	16.97	11.94	13.73	12.62	15.03	18.47	21.95	13.00	13.34	12.66	12.78	17.54	14.78	13.70	21.98	25.84	28.78	25.80	22.07	19.00
August	16.55	16.50	11.59	13.35	12.50	16.07	18.65	18.94	13.71	13.56	12.93	12.75	17.73	15.86	12.85	19.33	26.95	27.24	26.00	23.16	19.00
September	16.75	16.50	11.60	13.58	12.67	16.12	19.31	16.41	13.80	13.50	12.81	12.65	17.77	16.77	12.66	17.97	28.03	24.90	26.00	22.68	18.70
October	16.73	16.71	11.71	13.42	13.09	16.62	21.81	13.80	13.81	13.19	12.84	12.53	17.80	16.85	11.73	17.89	28.48	23.50	26.00	22.13	16.56
November	16.75	16.82	11.44	13.25	14.22	16.90	22.50	13.94	14.44	13.44	12.98	12.80	17.70	16.16	12.00	18.92	32.32	23.50	26.00	20.69	14.67
December	16.87	14.71	11.61	12.30	14.87	18.75	23.06	13.48	14.53	13.80	13.00	13.84	17.69	14.88	13.35	20.24	33.38	23.50	25.40	18.90	13.90

Spelter, at New York, Cents per Pound

January	4.55	4.08	4.28	4.82	4.95	6.17	6.48	6.90	4.54	5.15	6.26	5.55	6.52	7.15	5.29	6.59	18.19	9.94	7.88	7.38	9.62
February	4.69	3.94	4.18	5.00	4.95	6.12	6.09	7.00	4.78	4.99	5.89	5.56	6.71	6.45	5.40	8.84	20.13	10.48	7.99	6.70	9.14
March	4.60	3.89	4.29	5.36	5.05	6.06	5.96	6.92	4.76	4.81	5.72	5.65	6.98	6.26	5.28	9.29	18.40	10.77	7.64	6.52	8.92½
April	4.71	3.94	4.41	5.65	5.22	5.97	6.05	6.81	4.68	4.94	5.60	5.51	6.86	5.77	5.18	11.22	18.58	9.85	7.01	6.51	8.63
May	4.52	3.97	4.50	5.75	5.14	5.55	5.95	6.51	4.60	5.12	5.20	5.50	6.86	5.47	5.06	16.14	15.86	9.46	7.32	6.46	8.08
June	4.27	3.95	4.88	6.00	4.79	5.32	6.14	6.45	4.56	5.39	5.19	5.63	6.99	5.18	5.09	22.18	12.75	9.62	8.01	6.93	7.92
July	4.24	3.90	5.23	5.95	4.85	5.38	5.98	6.15	4.46	5.35	5.20	5.79	7.26	5.38	5.02	20.58	9.83	8.95	8.69	7.90	8.18
August	4.17	3.92	5.46	5.94	4.85	5.66	6.06	5.71	4.71	5.74	5.26	6.04	7.19	5.75	5.60	14.11	8.98	8.69	8.96	7.84	8.31
September	4.10	4.02	5.45	6.00	5.06	5.83	6.19	5.28	4.76	5.85	5.53	6.03	7.53	5.82	5.50	14.16	8.22	8.34	9.60	7.57	7.82
October	4.10	4.20	5.48	6.05	5.17	6.05	6.18	5.45	4.81	6.09	5.69	6.20	7.57	5.42	4.97	13.96	9.98	8.24	9.11	7.83	7.51
November	4.20	4.32	5.29	5.68	5.49	6.17	6.36	5.10	5.03	6.32	5.95	6.60	7.48	5.29	5.12	17.15	11.90	7.95	8.70	8.14	6.84
December	4.19	4.35	4.91	5.15	5.80	6.50	6.62	4.39	5.17	6.35	5.80	6.44	7.33	5.18	5.71	16.69	11.13	7.84	8.45	8.59	6.00

Lead, at New York, Cents per Pound

January	4.70	4.37	4.02	4.10	4.39	4.56	5.86	6.30	3.73	4.19	4.70	4.50	4.41	4.35	4.11	3.74	5.93	7.69	6.87	5.56	8.67
February	4.70	4.37	4.10	4.10	4.40	4.50	5.56	6.31	3.75	4.07	4.63	4.46	4.00	4.35	4.06	3.82	6.23	9.13	7.04	5.05	8.88
March	4.70	4.37	4.10	4.44	4.50	4.45	5.35	6.31	3.88	4.02	4.51	4.41	4.08	4.35	3.97	4.04	7.43	9.47	7.24	5.23	9.20½
April	4.70	4.37	4.10	4.59	4.50	4.50	5.39	6.16	4.02	4.19	4.40	4.44	4.20	4.40	3.82	4.20	7.73	9.43	6.95	5.03	8.95
May	4.22	4.37	4.10	4.37	4.48	4.50	5.90	6.02	4.26	4.32	4.37	4.40	4.20	4.37	3.90	4.25	7.45	11.00	6.88	5.05	8.55
June	3.90	4.37	4.10	4.25	4.22	4.51	5.94	5.75	4.45	4.36	4.38	4.46	4.50	4.35	3.90	5.89	6.87	11.68	7.55	5.33½	8.47½
July	4.03	4.37	4.10	4.12	4.17	4.56	5.80	5.24	4.50	4.35	4.40	4.50	4.67	4.37	3.90	5.59	6.34	10.72	8.04	5.65	8.67
August	4.26	4.37	4.10	4.12	4.15	4.64	5.78	5.12	4.59	4.36	4.40	4.50	4.54	4.64	3.87	4.68	6.26	10.72	8.05	5.77	8.98
September	4.36	4.37	4.10	4.26	4.20	4.85	5.92	4.84	4.54	4.39	4.40	4.49	5.04	4.73	3.86	4.62	6.88	8.84	8.05	6.12	8.11
October	4.37	4.37	4.10	4.40	4.20	5.07	5.94	4.64	4.34	4.39	4.49	4.31	5.03	4.52	3.52	4.60	7.00	6.77	8.05	6.45	7.24
November	4.37	4.37	4.10	4.25	4.51	5.48	5.97	4.45	4.39	4.40	4.44	4.31	4.66	4.33	3.68	5.16	7.13	6.44	8.05	6.76	6.33
December	4.37	4.19	4.10	4.19	4.60	5.96	6.19	3.76	4.24	4.56	4.50	4.45	4.32	4.06	3.80	5.33	7.60	6.48	6.71	7.03	4.37

Tin, at New York, Cents per Pound

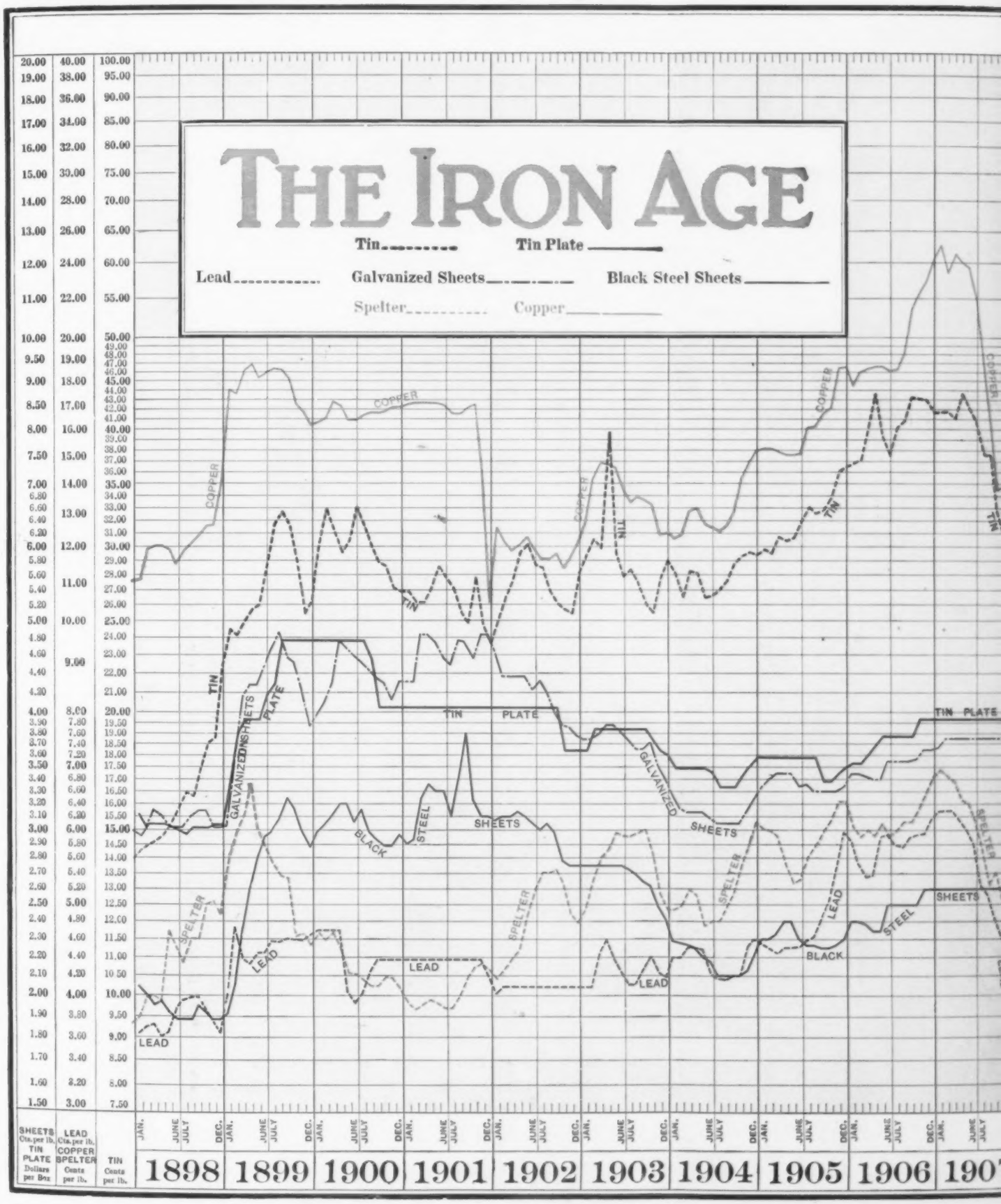
January	26.00	26.60	23.38	27.76	28.75	29.18	36.36	42.14	27.43	28.19	32.61	41.20	44.58	50.34	39.12	34.13	41.76	44.10	85.13	71.50	62.74
February	29.71	26.55	24.73	29.14	27.98	29.49	36.48	42.16	28.74	28.44	32.65	43.34	43.56	48.71	39.82	37.25	42.60	51.47	85.00	72.45	59.87
March	32.42	25.95	26.16	30.06	26.19	29.21	36.62	41.29	30.46	28.75	32.51	41.10	42.76	46.93	38.03	48.73	50.53	58.38	85.00	72.50	61.92½
April	30.85	25.94	27.29	29.69	27.99	30.43	38.86	40.84	31.79	29.35	32.83	42.05	43.64	49.04	36.10	47.64	51.51	55.82	88.53	72.50	62.12
May	29.25	26.82	29.26	39.26	27.76	30.04	43.08	43.01	29.84	29.07	33.05	43.32	45.98	49.06	33.21	38.79	49.14	63.21	100.00	72.50	54.99
June	30.00	28.22	29.29	28.30	26.14	30.36	38.97	42.65	28.18	29.26	32.79	46.25	47.44	45.01	30.60	40.26	42.07	61.93	91.00	71.83	48.33½
July	32.76	27.41	28.28	27.60	26.28	31.71	37.18	41.15	28.92	29.05	32.99	43.23	44.70	41.32	35.65	37.38	38.25	62.61	93.00	70.11	49.29
August	31.13	26.90	28.14	28.00	26.74	32.85	39.90	37.35	29.99	29.96	33.92	43.38	45.86	41.63	48.34	34.37	38.88	62.53	91.33	62.20	47.60
September	29.63	25.04	26.55	27.06	27.27	32.21	40.32	37.22	28.91	30.00	35.17	39.69	49.16	42.63	31.13	33.13	38.65	61.54	80.40	59.79	44.43
October	28.46	24.62	25.76	25.83	28.53	32.47	42.90	32.33	29.44	30.41	36.76	41.23	50.07	40.38	30.25	33.05	41.10	62.24	78.82	54.82	40.47
November	28.10	27.47	25.43	25.35	29.00	33.46	42.70	30.81	30.43	30.74	37.38	43.08	49.87	39.75	33.28	39.50	44.12	74.18	73.67	54.17	36.97
December	26.84	24.39	25.33	27.53	29.27	35.84	42.62	27.92	29.13	32.91	38.21	45.03	49.86	37.12	34.01	38.53	42.66	84.74	71.51	53.80	34.04

Tin Plate, at Pittsburgh, Dollars per Box

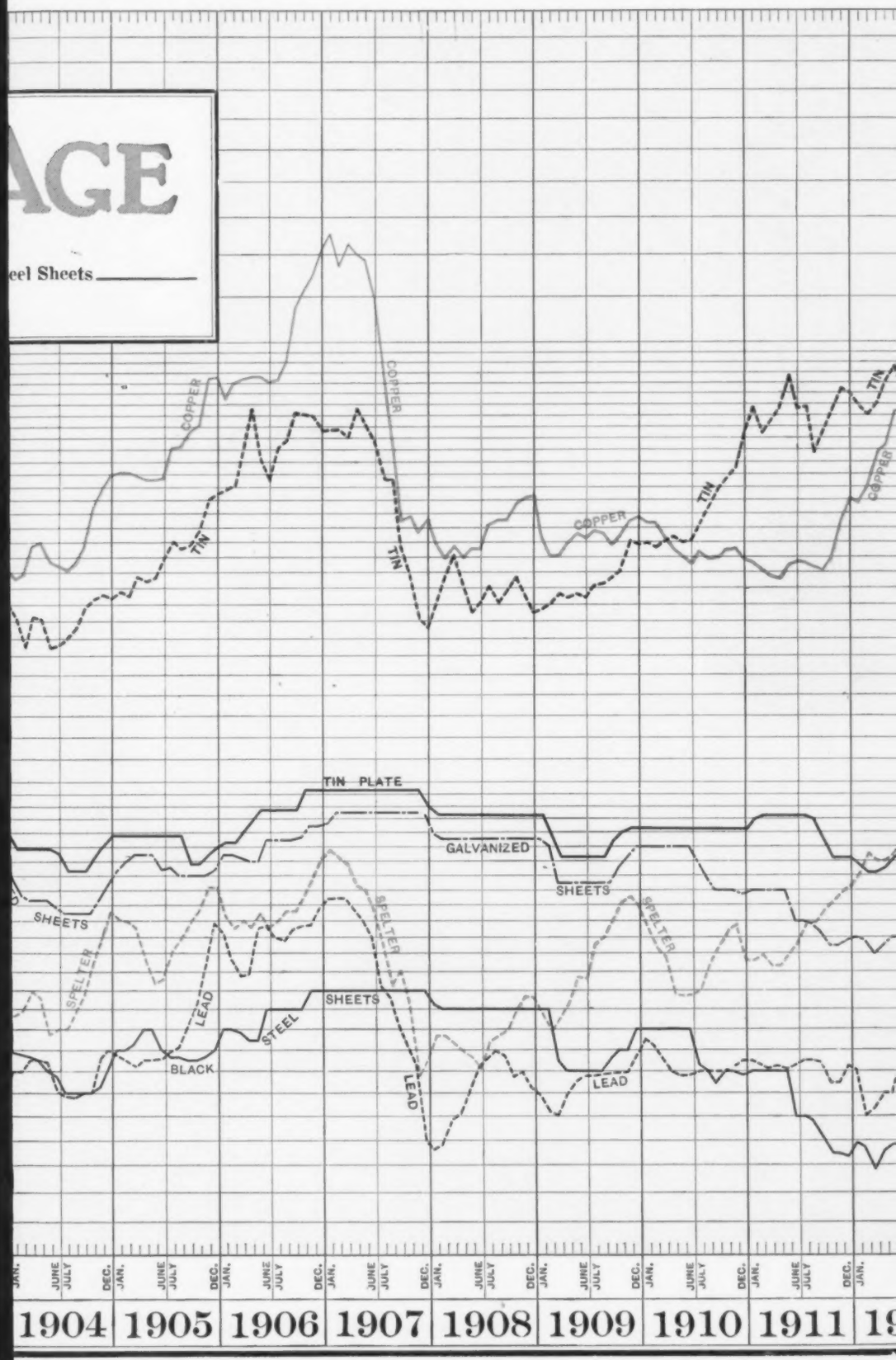
January	4.65	4.00	4.00	3.60	3.56	3.55	3.47	3.90	3.74	3.70	3.60	3.60	3.40	3.60	3.32	3.10	3.75	7.00	7.75	7.35	7.00
February	4.65	4.00	4.00	3.60	3.45	3.55	3.50	3.90	3.70	3.70	3.60	3.67	3.35	3.60	2.29	3.10	3.96	7.38	7.75	7.35	7.00
March	4.65	4.00	4.00	3.80	3.45	3.55	3.50	3.90	3.70	3.53	3.60	3.70	3.30	3.60	3.30	3.25	4.19	8.00	7.75	7.26	7.00
April	4.65	4.00	4.00	3.80	3.45	3.55	3.57	3.90	3.70	3.40	3.60	3.70	3.30	3.60	3.30	3.25	4.50	8.00	7.75	7.00	7.00
May	4.65	4.00	4.00	3.80	3.45	3.55	3.66	3.90	3.70	3.40	3.60	3.70	3.33	3.60	3.30	3.15	5.30	8.40	7.75	7.00	7.00
June	4.65	4.00	4.00	3.80	3.45	3.55	3.75	3.90	3.70	3.40	3.60	3.70	3.40	3.60	3.30	3.11	5.81	10.50	7.75	7.00	7.00
July	4.65	4.00	4.00	3.80	3.41	3.55	3.75	3.90	3.70	3.40	3.60	3.70	3.43	3.60	3.27	3.10	6.00	12.00	7.75	7.00	7.50
August	4.65	4.00	4.00	3.80	3.30	3.55	3.75	3.90	3.70	3.40	3.60	3.70	3.50	3.55	3.41	3.10	5.95	11.40	7.75	7.00	9.00
September	4.50	4.00	4.00	3.80	3.30	3.55	3.75	3.90	3.70	3.40	3.60	3.67	3.58	3.50	3.35	3.15	5.75	12.00	7.75	7.00	9.00
October	4.00	4.00	4.00	3.80	3.30	3.34	3.75	3.90	3.70	3.50	3.60	3.52	3.60	3.50	3.24	3.15	5.81	....	7.75	7.00	8.33
November	4.00	4.00	3.60	3.65	3.39	3.34	3.90	3.90	3.70	3.56	3.60	3.40	3.60	3.40	3.15	3.28	5.97	7.75	7.75	7.00	7.50
December	4.00	4.00	3.60	3.60	3.47	3.40	3.90	3.90	3.70	3.60	3.60	3.40	3.60	3.40	3.13	3.52	6.63	7.75	7.55	7.00	7.00

No. 28 Black Sheets, at Pittsburgh, Cents per Pound

January	2.97½	2.90	3.07½	2.75	2.29	2.30	2.40	2.60	2.52	2.50	2.40	2.20	1.90	2.31	1.87	1.80	2.60	4.50	5.00	4.70	4.47½
February	3.03	2.93¾	3.10	2.75	2.27½	2.30	2.40	2.60	2.50	2.50	2.40	2.20	1.87	2.35	1.95	1.80	2.60	4.69	5.00	4.70	5.00
March	3.10	3.22½	3.10	2.75	2.27	2.34	2.38	2.60	2.50	2.25	2.40	2.20	1.80	2.35	1.95	1.80	2.71	4.94	5.00	4.61	5.50
April	3.20	3.35	3.12½	2.75	2.25	2.40	2.35	2.60	2.50	2.20	2.40	2.20	1.86	2.35	1.91	1.80	2.85	5.75	5.00	4.35	5.50
May	3.20	3.30	3.10	2.75	2.20	2.40	2.35	2.60	2.50	2.20	2.40	2.20	1.90	2.30	1.85	1.79	2.89	7.00	5.00	4.35	5.50
June	3.05	3.30	3.05	2.75	2.16	2.30	2.50	2.60	2.50	2.20	2.40	2.00	1.90	1.27	1.81	1.75	2.90	7.88	5.00	4.35	5.50
July	3.14¾	3.10	3.00	2.73¾	2.10	2.26	2.50	2.60	2.50	2.20	2.23¾	2.00	1.95	2.25	1.80	1.75	2.90	8.50	5.00	4.35	6.75
August	2.98	3.41	3.05	2.70	2.10	2.26	2.50	2.60	2.50	2.20	2.21	1.99	2.02	2.21	1.86	1.85	2.90	8.50	5.00	4.35	7.50
September	2.93¾	3.77½	2.97½	2.65	2.10	2.25	2.50	2.60	2.50	2.26	2.15	1.91	2.07	2.14	1.95	1.90	2.93	8.50	5.00	4.35	7.37½
October	2.90	3.23	2.79	2.62	2.10	2.25	2.50	2.60	2.50	2.30	2.20	1.85	2.21	2.04	1.94	2.03	3.23	....	5.05	4.35	6.69
November	2.89	3.10	2.75	2.49	2.12½	2.27	2.60	2.60	2.50	2.30	2.20	1.85	2.25	1.97	1.87	2.25	3.65	5.00	5.00	4.35	5.77
December	2.96	3.10	2.75	2.32	2.22	2.30	2.60	2.60	2.50	2.40	2.19	1.83¾	2.25	1.89	1.82	2.50	4.31	5.00	4.85	4.35	4.35

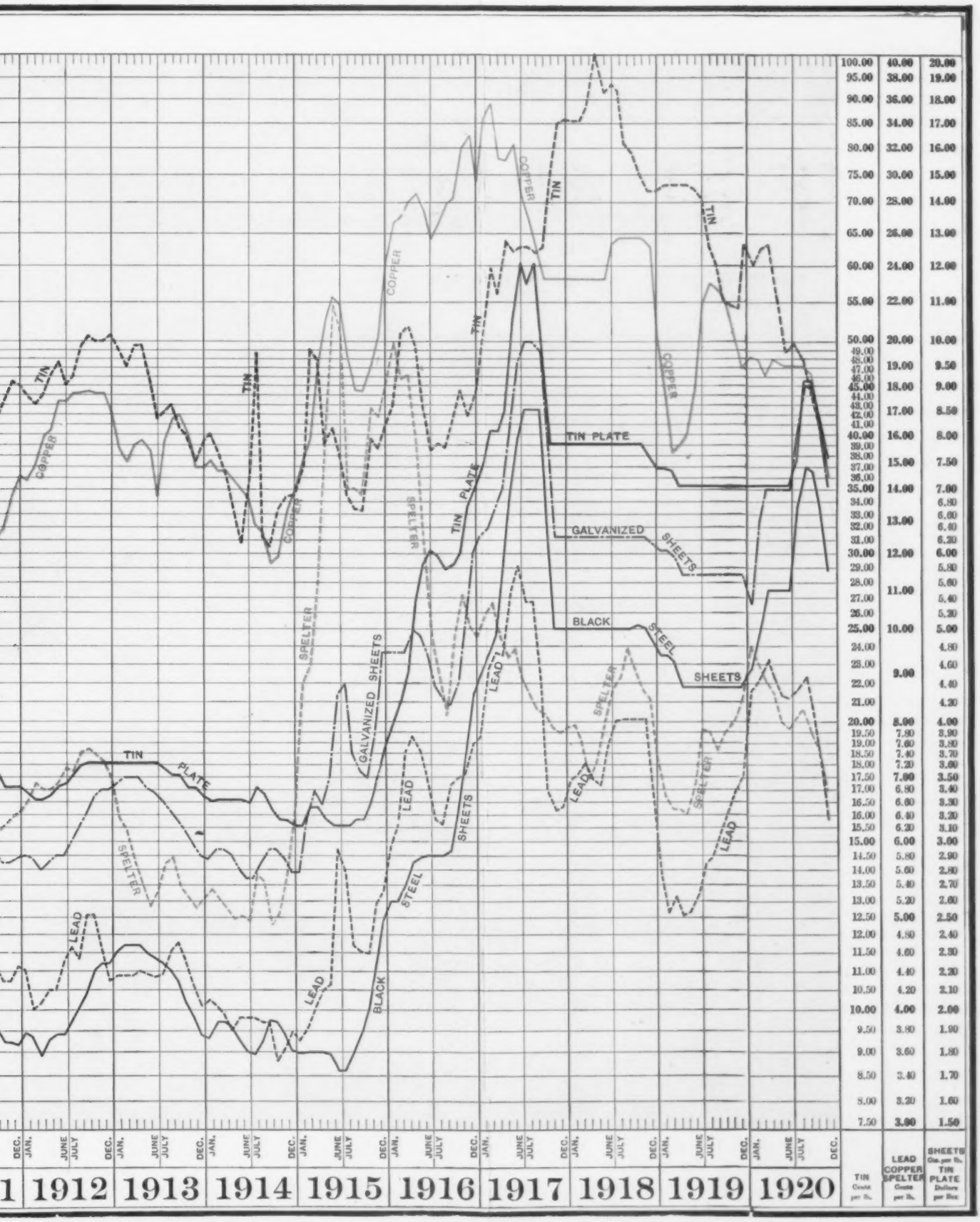


Fluctuations in Carload Prices of Lake Copper, Lead Sheets in Pit



es of Lake Copper, Lead, Tin and Spelter in New York

Sheets in Pittsburgh from Jan. 1, 1898, to J



York and Tin Plate and No. 28 Black and Galvanized
to Jan. 1, 1921.

Prices of Galvanized Sheets from 1900 to 1920

The table below gives the monthly average prices, f.o.b. Pittsburgh, in cents per pound, of galvanized sheets, as quoted in THE IRON AGE from the beginning of 1900 down to the present month:

Average Prices of No. 28 Galvanized Sheets, at Pittsburgh, in Cents per Pound

	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	3.83	4.36	4.64	3.70	3.36	3.35	3.45	3.67	3.59	3.55	3.50	3.20	2.90	3.46	2.87	2.79	4.75	6.25	6.25	6.05	5.32½
February	4.09	4.36	4.36	3.70	3.25	3.40	3.45	3.75	3.55	3.51	3.50	3.20	2.87	3.50	2.95	3.16	4.75	6.38	6.25	6.05	6.50
March	4.32	4.84	4.36	3.78	3.23	3.45	3.43	3.75	3.55	3.26	3.50	3.20	2.80	3.50	2.95	3.40	4.75	6.69	6.25	5.96	7.00
April	4.78	4.84	4.36	3.89	3.23	3.45	3.40	3.75	3.55	3.25	3.50	3.20	2.86	3.50	2.91	3.29	5.00	7.00	6.25	5.70	7.00
May	4.66	4.74	4.36	3.88	3.23	3.45	3.40	3.75	3.55	3.25	3.50	3.20	2.90	3.42	2.80	3.50	4.94	8.20	6.25	5.70	7.00
June	4.59	4.59	4.23	3.81	3.18	3.35	3.55	3.75	3.55	3.25	3.50	3.00	2.90	3.38	2.75	4.28	4.69	9.50	6.25	5.70	7.00
July	4.53	4.48	4.26	3.73	3.14	3.36	3.55	3.75	3.55	3.25	3.39	3.00	3.00	3.33	2.75	4.40	4.38	10.00	6.25	5.70	8.25
August	4.43	4.74	4.18	3.66	3.14	3.32	3.55	3.75	3.55	3.25	3.30	2.99	3.12	3.24	2.85	3.71	4.21	10.00	6.25	5.70	9.00
September	4.33	4.73	3.99	3.66	3.14	3.30	3.55	3.75	3.55	3.28	3.21	2.93	3.21	3.16	2.95	3.56	4.18	9.75	6.25	5.70	8.87½
October	4.25	4.55	3.87	3.73	3.14	3.30	3.58	3.75	3.55	3.35	3.20	2.85	3.36	3.08	2.95	3.50	4.41	....	6.25	5.70	8.18
November	4.16	4.84	3.85	3.51	3.23	3.32	3.65	3.75	3.55	3.43	3.20	2.85	3.40	2.98	2.88	3.89	5.18	6.25	6.25	5.70	7.04
December	4.36	4.84	3.78	3.40	3.31	3.35	3.65	3.75	3.55	3.50	3.19	2.89	3.40	2.90	2.78	4.75	6.00	6.25	6.15	5.70	5.70

The highest prices realized for galvanized sheets, aside from the war peak in 1917, were obtained in April, 1916, following the spectacular performances of spelter, when prices of that metal soared to an unprecedented height. At that time, No. 28 galvanized sheets sold up to 5.30c. per lb., Pittsburgh, or higher, although the average for the month is placed, in the table, at 5c. It is interesting to know that in 1901, in a period of great activity in the steel trade, No. 28 galvanized sheets were regularly quoted at 5.10c., Pittsburgh, for two weeks, namely, the first half of September.

In making up the above table of prices the compiler has used for January, February and March, 1919, up to March 21, the prices in effect to the latter date, and then used the 5.70c. price in effect all through the year from March 21. Premiums were paid during late November and all of December, but premiums have not been recorded above, as a large percentage of the sheets sold in 1919 were at the prices named in the table.

Sales to foreign countries were heavier in 1920 than in 1919, Germany having been a relatively large buyer. The total exports for 1920 were considerably larger than in 1919.

Tin Fluctuated With Foreign Exchange

The tin market as usual was subject in 1920 to many influences, some of which always control it—speculation in London, conditions in the Far East, foreign exchange values and industrial conditions in this and other countries.

A dominant factor early in 1920 was wild speculation in London during which tin advanced to over £400 per ton. By the end of the year the price there had fallen to close to £200 per ton. While this had its influence here the changes were not so drastic. The high mark in the American tin market last year was 64c. per lb. for spot Straits, New York, on Feb. 24. Until June 1 the price ranged between this level and 51c. From that time on values fell until at the close of the year spot Straits was quoted at 33c. to 34c., New York. As compared with other years this was the lowest price since 1915 when 33c. prevailed in the summer of that year. In June, 1918, it soared to $1 per lb.

The same conditions affected the tin market late in 1920 which were potent in the other metals. Consumers gradually withdrew from the market and even dealers and speculators lost interest. All through the year weakness in the pound sterling was an important factor. A feature of the later transactions was the frequent sales made under the rule in the New York Metal Exchange.

Imports of tin were heavy in 1920. To Dec. 1, the total had been 48,093 gross tons against 29,956 tons to Dec. 1, 1919. Of the 1920 total, 35,210 tons came from the Straits Settlement.

During the year American refined tin became more of a market factor. It was authoritatively estimated that at least 15 per cent of the country's total consumption in 1920 was of American origin, that is, refined in American plants from foreign ores.

Imports of Lead a Factor Last Year

Practically until September the price of lead remained at close to 9c., New York, which was a higher value than realized in either 1918 or 1919. In fact in only one year since 1898 had lead sold as high when it nearly reached 12c. in 1917. From 1908 to 1914, inclusive, it had hovered around 5c., New York.

The high price level of this metal is the outstanding feature of the 1920 market. The cause was the very heavy consumption which set in late in 1919 and continued until the fall of 1920, unrelieved by adequate production. The year opened with a quotation of 8c., New York, which advanced to 9.50c. as the maximum for the year on March 6. After that the market ranged between 8.25c. and 9.12½c. until early September. By that time the London market had declined sharply until imports of lead were threatened. From that time on there was a marked recession in values as well as in consumption, in sympathy with the nation-wide shrinkage in business, until the metal fell below the 5c. level early in December.

The second important factor in the 1920 market was the heavy importation from September on which grew to larger proportions than expected and which relieved the strain on the market. The collapse of speculation in London resulting in lower prices, and the low value of exchange enabled importers here to sell foreign lead in competition with domestic until the New York and St. Louis prices were on a parity much of the time during the latter part of the year,—an unusual feature.

As the year closed further weakness in London threatened this market so that values fell below the 5c. level at both New York and St. Louis, or about 4.50c., due to the possibility of importations.

Exports during the year were light having been only about one-third those for 1919 and one-quarter than for 1918. Imports were heavy, as already indicated, having been to Oct. 1 about six times those for the same period in 1919 and three times those for the first nine months of 1918.

Heavy Exports of Zinc

Two features characterizes the zinc market of 1920: Heavy exports and later such a decline in values that zinc, sold to England, was actually resold to the United States and imported in competition with the regular product. The latter is a rather unusual development.

As to values, the course of the market during the year was an almost continuous decline. In January prime Western sold at 9.45c., St. Louis, or 9.80c., New York during the speculative boom in England. Exports at that time were heavy. From that time on the decline was gradual until the low level of 5.60c. St. Louis, or 6c., New York, was reached on Nov. 30, and practically the same level late in December following a brief rally.

The extent of the readjustment in this market is

reflected by the fact that the lowest previous price since the war was 6c., St. Louis, in May, 1919, while previous to the war zinc touched 4.75c. in the fall of 1914.

While at the end of the year prices had not reached pre-war levels, nevertheless costs of production were relatively so much higher than formerly that producers reduced output sharply and refrained from selling except for early delivery and only to such customers as seemed wise and necessary.

Exports during the year reached the largest proportions on record, outside of war years, sent out mostly in the early part of the year, England having been the largest buyer.

Scrap Prices Reached High and Low Levels in 1920

Increased Use of Old Material—Statistics of Tonnages Required—Extremely Low Quotations

SHORTAGE of pig iron and transportation difficulties served to enhance greatly the values of various forms of iron and steel scrap at certain periods in 1920, with the result that some grades reached the highest prices ever known, with the exception of the war period.

Toward the end of the year, the market went to the other extreme and the prices established in the closing fortnight of the year were close to the lowest on record for many years.

This example will illustrate: The highest prices on record for heavy melting steel delivered in the Pittsburgh district were reached in June, 1917, when the average for the month, as quoted by THE IRON AGE, was $41. The high mark in 1920 was reached in September, when the average for the month was $29. Only a few times in nearly 20 years has the price of heavy melting steel at Pittsburgh dropped below $11. However, at the close of 1920, with much higher freight rates and higher labor costs than prevailed before the war, the price dropped to $15. Thus a drop of $14 in the price of this material within four months leads the

(*Continued on page* 104)

The Course of Ferromanganese Prices for Ten Years

KEY TO CHART

I. The price on Sept. 26, 1912, was $65 per ton, the highest since September, 1907.

II. During October, 1913, German ferromanganese appeared in the market, maintaining a price from $1 to $2 per ton less than the British quotation. German shipments ceased in August, 1914.

III. Aug. 6, 1914, was the first week of the world war, and with German shipments cut off and British deliveries uncertain, ferromanganese sold as high as $150 per ton spot. The average shown is for three weeks.

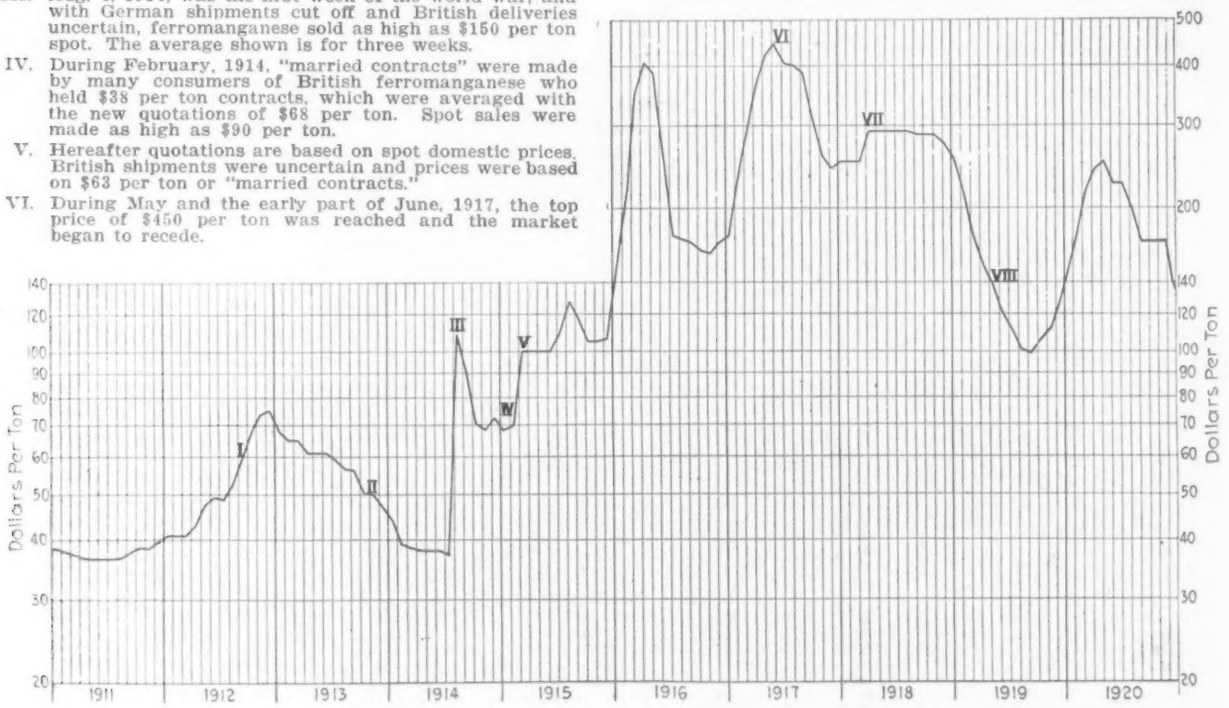
IV. During February, 1914, "married contracts" were made by many consumers of British ferromanganese who held $38 per ton contracts, which were averaged with the new quotations of $68 per ton. Spot sales were made as high as $90 per ton.

V. Hereafter quotations are based on spot domestic prices. British shipments were uncertain and prices were based on $63 per ton or "married contracts."

VI. During May and the early part of June, 1917, the top price of $450 per ton was reached and the market began to recede.

VII. In April, 1918, it was decided to reduce the standard of ferromanganese from 80 per cent to 70 per cent, with $4 per unit added or subtracted from the $250 quotation. We quote 80 per cent.

VIII. From May 22, 1919, until Nov. 13, 1919, we quote British ferromanganese, which was from $5 to $10 per ton less than domestic and dominated the market.



Monthly Averages of Ferromanganese Quotations

(*Jan.* 1, 1911, *to Jan.* 1, 1921)

	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$38.03¾	$41.00	$68.00	$44.40	$68.00	$150.00	$175.00	$250.00	$255.00	$146.00
February	37.68¾	41.00	65.00	39.25	69.75	207.50	231.25	250.00	215.00	172.50
March	37.10	41.00	65.00	38.50	100.00	349.60	290.00	250.00	175.00	216.25
April	36.75	43.00	61.00	38.00	100.00	406.25	362.50	290.00	150.00	240.00
May	36.50	47.50	61.00	38.00	100.00	387.50	420.50	290.00	138.40	250.00
June	36.50	49.25	61.00	38.00	100.00	270.00	443.75	290.00	121.00	225.00
July	36.50	48.87½	59.00	37.20	109.00	175.00	406.25	290.00	111.00	225.00
August	36.70	52.40	56.37½	108.33⅓	127.25	172.00	400.00	290.00	101.25	198.75
September	37.75	59.62½	56.00	90.00	117.00	169.75	387.50	285.00	98.75	170.00
October	38.50	67.80	50.10	70.40	105.00	162.25	310.00	285.00	105.00	170.00
November	38.40	73.75	50.00	68.00	105.00	160.80	256.00	285.00	112.50	170.00
December	39.75	75.00	47.00	72.20	106.00	169.75	243.75	275.00	122.50	135.00

Philadelphia Scrap Prices, 1901 to 1920

These Prices, Delivered Eastern Pennsylvania, Are Averaged from Weekly Quotations in THE IRON AGE

Heavy Melting Steel Scrap—Per Gross Ton

	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$14.90	$18.30	$20.00	$11.56	$17.44	$17.33	$18.61	$11.70	$16.94	$17.00	$12.50	$12.19	$14.40	$10.40	$10.00	$16.38	$21.70	$30.00	$17.20	$24.75
February	15.62	19.00	20.19	12.56	17.37	16.62	18.69	14.25	15.58	16.62	13.50	11.70	12.87	11.00	10.00	16.50	20.63	30.00	14.75	25.62
March	16.00	20.12	20.75	14.00	17.62	15.80	18.87	13.12	13.50	16.50	14.05	11.80	13.25	11.31	10.80	16.90	23.50	29.00	14.19	25.20
April	16.75	20.87	20.75	14.69	17.56	16.69	18.75	12.75	13.25	16.12	13.31	12.94	13.44	10.95	11.00	17.88	24.88	28.00	15.50	24.12
May	16.55	21.00	20.56	12.50	15.94	16.30	18.95	12.81	14.75	14.75	13.00	13.50	12.10	10.63	11.25	16.60	25.40	29.00	15.00	23.37
June	15.75	20.94	20.50	11.35	14.55	15.75	18.75	13.25	15.81	14.45	13.00	13.50	11.75	10.50	11.10	15.31	34.13	29.00	16.12	22.60
July	15.81	21.00	19.00	11.12	15.16	15.87	17.62	13.80	15.80	14.12	13.19	13.50	11.35	10.30	12.06	14.94	35.20	29.00	18.90	22.62
August	16.70	20.50	17.37	11.75	15.56	16.75	16.85	14.50	16.87	13.75	13.15	13.65	11.43	10.19	13.75	14.75	31.88	29.00	19.37	25.00
September	16.44	20.50	15.87	11.90	15.69	17.94	16.50	15.19	17.40	13.85	12.50	14.50	11.62	10.69	15.00	14.75	30.25	29.00	18.62	25.62
October	17.50	20.55	13.85	12.87	16.56	18.12	15.35	15.00	18.00	13.81	11.94	15.10	11.15	9.95	14.75	15.63	25.00	29.00	19.10	22.75
November	17.19	20.50	11.87	14.75	17.55	18.70	12.94	15.75	18.00	13.50	11.55	15.50	10.19	9.25	14.65	20.13	26.00	28.00	20.62	19.00
December	17.81	20.25	11.25	16.20	17.50	19.50	11.50	17.10	17.50	12.65	12.03	15.25	10.00	9.40	15.81	23.75	28.20	25.00	22.50	15.25

Heavy Cast Scrap—Per Gross Ton

January	$14.50	$14.40	$19.75	$12.75	$16.00	$16.00	$21.70	$15.30	$15.87	$17.00	$14.00	$13.42	$14.50	$12.00	$12.00	$17.00	$20.20	$30.00	$23.80	$36.00
February	14.00	14.81	19.81	12.81	15.62	15.87	22.00	15.00	15.00	16.12	14.38	13.00	14.37	12.88	12.00	17.00	20.00	30.00	23.00	40.00
March	14.00	16.00	20.00	13.30	15.75	15.50	22.25	15.00	14.00	16.00	14.40	13.12	14.00	13.00	12.00	17.00	21.75	30.00	21.25	39.20
April	14.00	17.06	20.00	13.37	16.00	15.50	21.25	15.00	14.10	15.87	13.44	13.62	13.94	13.00	11.75	17.88	26.63	29.00	22.00	38.00
May	13.95	17.70	19.25	12.50	15.19	15.40	20.80	14.87	14.69	15.06	13.13	13.75	13.60	12.25	12.13	17.50	29.00	29.00	21.50	37.75
June	13.52	18.25	18.37	11.60	14.20	15.37	20.75	14.25	15.00	15.00	13.00	13.75	13.25	12.00	12.25	16.50	33.50	29.00	22.00	37.00
July	13.62	17.75	17.50	11.25	14.00	15.12	19.25	14.00	14.85	14.94	13.06	13.75	13.00	12.00	12.38	16.00	36.30	29.00	22.10	37.50
August	13.75	18.25	15.87	11.50	14.40	16.30	18.60	14.25	15.37	14.25	13.20	13.75	12.87	12.00	13.30	16.00	33.25	29.00	24.75	39.00
September	13.75	19.00	14.75	11.50	15.12	17.44	18.00	15.25	15.90	14.00	12.60	14.96	12.81	12.00	14.00	16.00	31.00	29.00	25.00	39.25
October	13.75	19.50	13.90	12.37	15.75	18.37	17.60	15.25	16.94	14.00	13.44	14.50	13.50	11.40	14.00	16.15	28.00	29.00	25.20	38.75
November	14.00	19.50	12.87	13.75	16.00	19.20	16.50	15.44	17.50	14.00	12.25	14.75	12.62	11.00	14.50	18.50	30.00	29.00	27.62	33.80
December	14.00	19.50	12.50	14.90	16.00	21.12	15.50	16.00	17.50	14.00	13.00	15.00	12.17	11.30	16.06	20.75	30.60	29.00	30.75	24.50

Machine Shop Turnings—Per Gross Ton

January	$ 9.85	$12.95	$16.00	$8.94	$14.50	$14.50	$16.05	$9.00	$13.63	$14.38	$8.12	$9.00	$11.20	$7.30	$8.00	$11.13	$12.90	$19.00	$12.60	$18.75
February	10.00	13.50	16.00	9.12	15.75	13.81	16.25	9.87	12.00	13.50	9.19	9.25	10.37	9.00	8.00	9.88	12.38	18.63	10.25	21.00
March	10.89	14.44	16.50	9.45	15.19	13.55	16.75	9.62	10.08	12.80	10.00	8.80	10.12	8.75	8.13	10.25	14.13	18.25	11.00	20.50
April	12.00	16.37	16.50	10.12	14.75	13.81	16.55	8.40	10.10	11.44	8.81	9.69	10.31	7.90	8.25	11.00	15.25	18.50	11.80	19.00
May	12.00	16.20	15.75	9.50	13.50	13.19	16.95	9.12	11.62	9.94	8.25	10.40	9.20	7.50	8.44	11.75	16.00	18.50	10.62	18.50
June	11.56	16.00	15.12	8.20	11.00	12.31	16.94	9.50	12.50	9.65	8.40	10.31	8.00	7.69	8.50	8.63	20.25	18.50	11.75	18.40
July	11.50	16.50	14.40	7.94	10.66	11.69	15.37	9.80	12.45	9.62	9.00	10.50	7.85	7.75	8.63	8.50	23.70	18.50	13.50	18.12
August	11.50	16.12	13.00	8.56	12.90	12.65	14.30	10.75	13.50	8.81	9.30	10.65	8.00	7.94	9.80	8.05	20.75	18.50	15.00	18.37
September	11.56	16.00	11.00	8.75	13.62	13.75	14.00	11.50	14.35	8.75	8.19	10.94	8.00	8.56	10.56	7.44	20.38	18.75	15.00	19.87
October	11.75	16.00	10.50	9.00	14.25	14.25	12.85	11.80	15.50	8.62	8.00	11.40	7.85	7.90	10.13	10.13	18.00	19.00	15.10	18.25
November	12.25	16.00	9.75	9.62	14.40	13.85	10.50	12.94	15.06	8.50	8.00	11.50	7.00	11.50	10.25	10.38	18.00	19.00	17.00	16.20
December	12.75	16.00	9.19	12.50	14.50	15.94	9.00	13.90	14.15	8.15	8.91	11.00	7.08	7.65	11.00	13.50	18.20	18.00	18.50	13.75

Cast Borings—Per Gross Ton

January	$7.94	$8.00	$10.00	$6.50	$11.19	$11.00	$13.55	$7.00	$12.62	$12.22	$8.12	$8.31	$10.85	$7.80	$8.00	$11.50	$13.94	$17.00	$11.00	$22.50
February	8.00	8.00	10.69	7.00	11.25	10.31	14.50	8.37	11.00	11.50	8.81	8.00	10.37	9.19	8.00	11.00	13.38	17.38	9.50	23.87
March	8.00	8.62	11.12	7.35	11.31	9.85	15.37	7.75	8.17	11.20	9.60	8.50	10.06	8.94	8.00	11.00	15.00	17.50	9.50	22.10
April	8.37	10.00	11.55	7.56	11.25	10.25	15.69	7.50	8.65	10.38	8.25	9.37	10.25	8.30	8.00	11.38	15.63	17.50	13.30	20.00
May	8.75	10.05	11.06	6.75	9.87	9.50	16.00	8.12	9.87	9.84	7.75	9.60	9.17	8.00	8.00	12.75	16.10	17.50	12.50	20.00
June	8.00	10.37	10.31	6.35	8.00	9.37	16.12	8.75	10.50	8.80	7.90	9.50	8.25	8.00	8.10	10.00	21.50	17.63	12.75	20.00
July	7.81	10.50	9.40	6.12	7.83	9.31	14.37	9.00	10.40	9.50	8.63	9.56	7.85	8.00	8.50	10.00	25.00	18.00	13.80	20.00
August	7.25	10.12	8.31	6.50	9.20	10.25	13.50	10.00	11.44	9.31	8.80	9.75	7.94	8.50	9.80	9.50	22.25	18.38	14.62	20.60
September	7.31	10.00	7.50	6.75	9.87	11.25	12.81	11.00	12.45	9.25	7.69	10.06	8.18	8.56	10.44	9.13	22.00	18.75	15.25	23.62
October	7.50	10.00	7.15	7.11	9.87	11.37	11.20	11.25	13.37	9.06	7.50	10.85	7.90	8.00	10.25	10.10	19.20	19.00	17.30	22.00
November	7.87	10.19	6.81	7.75	10.60	12.50	8.37	12.00	13.19	8.50	7.50	11.37	7.50	7.50	10.05	11.63	20.00	19.00	19.62	20.60
December	8.00	10.00	6.44	9.80	10.50	13.00	7.00	12.75	12.10	8.15	8.09	10.83	7.17	7.65	11.00	14.50	20.00	17.00	21.75	16.25

No. 1 Railroad Wrought—Per Gross Ton

January	$18.00	$20.00	$22.40	$15.12	$20.75	$21.16	$22.55	$14.30	$19.50	$19.56	$15.63	$15.37	$16.10	$13.05	$12.00	$22.00	$26.60	$35.00	$24.20	$33.50
February	18.12	21.00	22.87	15.75	21.50	19.87	21.50	15.94	17.75	18.94	16.06	14.00	15.12	14.38	12.00	21.63	25.50	35.00	21.50	36.00
March	19.50	22.50	23.25	17.20	22.37	19.20	21.12	15.31	15.00	19.00	17.20	14.12	15.25	14.00	12.50	22.13	30.75	35.00	20.25	35.90
April	19.50	24.37	23.45	17.75	22.50	20.00	20.50	15.00	15.25	18.69	16.06	15.44	15.37	13.25	12.69	23.38	36.00	35.00	21.60	35.00
May	19.00	23.60	22.50	15.75	18.75	19.20	20.60	15.00	17.12	17.50	15.25	15.75	15.00	12.63	12.94	22.50	41.40	34.00	21.00	33.50
June	18.12	23.37	20.87	13.00	16.00	17.87	20.75	15.25	18.19	16.70	15.00	15.44	14.75	12.50	13.00	20.50	51.25	34.00	21.50	33.00
July	17.50	23.00	19.40	12.69	16.16	17.50	19.13	15.95	17.45	16.00	15.13	15.50	13.90	12.20	13.44	19.50	50.60	34.00	24.40	33.00
August	18.00	23.00	17.50	13.44	18.80	19.70	18.30	17.50	18.87	15.37	15.70	15.80	14.00	12.00	14.95	20.20	45.00	34.00	26.50	33.00
September	17.87	23.75	17.00	14.45	20.50	21.25	18.00	18.25	19.95	16.10	14.75	16.31	14.68	12.38	16.50	20.00	44.00	34.00	26.50	33.25
October	18.20	23.70	16.50	15.37	21.62	22.25	17.50	18.30	20.75	16.19	13.94	16.80	14.00	11.80	16.13	21.63	37.20	34.00	26.90	29.25
November	19.75	22.50	15.25	17.00	22.70	22.25	15.75	19.19	20.75	16.00	13.85	17.06	13.00	11.50	16.50	24.13	35.00	34.00	28.37	25.00
December	20.00	22.00	14.50	19.10	21.87	23.25	14.62	19.95	19.50	15.90	15.00	16.25	12.75	11.50	20.06	26.75	35.00	33.00	30.25	20.00

Old Iron Axles—Per Gross Ton

January	$20.00	$24.00	$29.00	$15.50	$23.12	$27.50	$31.00	$23.00	$24.25	$28.00	$26.00	$22.25	$26.20	$21.00	$17.50	$27.00	$43.40	.....	.....	$45.00
February	20.00	24.50	29.25	18.25	23.25	26.50	31.00	23.00	22.00	27.62	26.00	22.00	27.00	23.00	17.50	27.00	43.00	.....	.....	45.00
March	21.50	25.50	30.00	20.10	25.25	24.60	31.00	21.00	18.00	27.60	26.00	22.00	27.00	22.25	17.50	27.00	43.00	.....	.....	45.00
April	22.00	26.25	30.00	21.75	26.00	25.62	30.37	20.00	18.10	28.00	25.00	23.37	26.75	21.00	17.50	28.00	46.00	.....	.....	45.00
May	21.70	27.40	29.00	18.75	24.50	25.50	30.70	20.00	20.75	26.50	24.25	23.00	26.00	20.00	17.50	28.00	47.00	.....	.....	45.00
June	21.50	29.00	26.75	16.80	21.80	25.00	31.12	20.00	22.25	26.50	24.00	23.25	25.50	20.00	17.50	28.00	47.00	.....	.....	45.00
July	21.50	29.00	24.80	17.25	21.33	25.12	29.00	20.80	23.50	26.50	24.25	24.00	25.00	20.00	17.75	28.00	.....	.....	.....	45.00
August	22.40	29.50	20.62	17.62	24.00	27.40	28.30	22.25	24.00	26.50	24.50	24.00	25.00	20.00	20.60	28.00	.....	.....	.....	45.00
September	22.00	29.25	29.25	18.10	25.00	29.87	27.50	22.50	26.30	26.50	24.00	24.12	25.00	19.75	22.00	34.25	.....	.....	.....	45.00
October	23.50	30.00	18.80	19.25	26.12	31.00	27.20	22.50	29.00	26.50	23.50	24.70	25.00	17.80	22.00	35.00	.....	.....	.....	42.50
November	23.75	29.25	17.50	20.44	27.30	31.30	24.50	23.25	30.00	26.50	21.30	25.75	22.00	17.50	22.00	40.00	.....	.....	.....	34.50
December	24.00	29.00	15.62	23.10	27.12	32.00	23.00	23.95	30.00	26.50	21.50	26.00	21.00	17.50	25.75	45.00	.....	.....	$45.00	30.00

Old Steel Axles—Per Gross Ton

January	$17.00	$19.00	$25.00	$14.25	$20.12	$20.62	$22.30	$18.10	$22.50	$23.00	$19.50	$17.25	$19.80	$15.50	$13.38	$25.00	$43.40	.....	.....	$39.00
February	17.00	.....	25.25	16.00	20.25	19.87	21.81	18.00	20.50	22.62	20.12	17.00	19.00	16.75	13.50	25.00	43.00	.....	.....	39.00
March	17.00	22.00	26.00	17.00	21.25	19.30	22.00	17.62	17.00	22.40	20.80	17.00	19.00	16.25	14.00	25.00	43.00	.....	.....	40.20
April	17.00	24.33	26.00	18.00	22.25	20.12	21.62	17.50	17.05	22.00	20.00	17.00	19.00	15.05	14.00	26.00	46.00	.....	.....	42.00
May	17.00	25.40	26.00	15.50	19.62	19.60	21.80	17.62	18.75	20.62	19.31	17.00	17.70	14.00	14.00	26.00	47.00	.....	.....	42.00
June	17.00	27.00	23.00	15.00	17.30	19.25	21.87	18.00	20.50	20.50	19.25	17.25	17.50	14.00	14.00	26.00	47.00	.....	.....	42.00
July	17.00	27.50	21.80	14.75	17.00	18.75	20.25	18.30	21.30	20.12	19.37	17.50	17.50	14.00	14.25	26.00	.....	.....	.....	42.00
August	17.00	26.25	19.50	14.62	20.10	20.75	20.20	19.62	21.87	20.00	19.50	17.50	17.50	14.50	17.60	30.00	.....	.....	.....	42.00
September	17.50	26.00	18.00	15.20	21.00	22.25	20.00	21.25	22.90	20.00	19.00	18.00	18.12	14.81	19.50	34.25	.....	.....	.....	42.00
October	19.00	25.90	16.40	16.25	21.12	23.87	20.00	21.25	23.62	20.00	18.00	18.70	18.10	13.60	19.50	35.00	.....	.....	.....	40.25
November	19.00	25.25	14.50	17.87	21.50	23.30	19.62	21.62	24.00	20.00	17.20	19.75	16.44	13.00	20.70	40.00	.....	.....	.....	33.75
December	19.25	25.00	14.12	18.70	21.50	24.50	18.50	22.20	24.00	19.50	17.25	20.00	15.56	13.00	25.00	45.00	.....	.....	$34.00	25.60

Old Carwheels—Per Gross Ton

January	$17.00	$16.95	$20.30	$12.87	$16.00	$18.75	$23.00	$18.20	$16.00	$17.50	$15.00	$12.37	$16.20	$12.20	$11.00	$16.38	$21.50	$30.00	$24.60	$36.00
February	16.87	17.00	22.62	13.00	16.00	18.75	23.00	16.62	15.50	16.81	13.44	12.00	15.37	12.63	10.63	16.50	20.50	30.00	23.00	40.62
March	16.50	17.44	24.50	13.20	16.70	17.70	23.62	15.00	14.00	16.75	14.00	11.94	15.00	12.50	11.00	16.70	21.50	30.00	23.00	42.40
April	16.75	17.75	24.20	13.50	17.00	16.75	24.00	14.00	14.05	16.06	13.19	12.87	14.87	12.00	11.00	17.38	25.75	29.00	23.10	40.00
May	17.50	19.50	23.62	12.00	16.00	16.75	24.80	14.00	14.25	15.12	13.00	13.90	13.75	11.75	11.38	16.70	28.00	29.00	21.00	40.00
June	17.50	19.75	21.87	11.20	14.90	16.69	25.37	13.75	15.00	14.90	13.10	14.00	13.12	11.19	11.55	16.38	34.00	29.00	22.00	38.00
July	17.50	20.60	21.30	10.75	14.25	16.19	25.00	13.50	15.05	14.25	12.94	14.00	12.20	11.00	12.38	15.63	36.20	29.00	23.20	38.50
August	16.70	20.00	19.12	11.25	15.20	16.75	23.90	14.75	15.62	13.94	13.00	14.05	12.37	11.25	13.25	15.50	34.50	29.00	24.50	40.60
September	16.50	20.00	18.25	11.80	15.50	18.27	23.00	15.00	16.80	13.75	12.56	14.25	12.75	11.25	14.00	15.50	32.50	29.00	24.50	42.75
October	16.20	19.25	16.40	12.37	16.37	20.94	22.40	15.00	17.50	13.75	11.75	14.87	12.46	10.10	13.75	15.88	29.00	29.00	24.50	40.50
November	16.12	20.50	14.43	13.81	17.10	22.00	19.00	15.62	17.50	13.50	11.35	15.00	12.00	9.50	14.03	18.88	31.25	29.00	27.75	36.40
December	16.75	20.00	12.75	14.60	18.12	23.00	19.00	16.00	17.50	13.25	12.33	15.50	12.00	10.00	15.63	22.38	32.40	28.00	30.50	28.00

Scrap Prices at Chicago 1905 to 1920

These Prices Are Averaged from Weekly Quotations in THE IRON AGE

Heavy Melting Steel Scrap, per Gross Ton

	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January	$14.88	$14.95	$16.80	$11.05	$13.94	$16.00	$11.75	$10.75	$12.60	$9.35	$9.19	$15.50	$21.12	$30.00	$17.40	$24.50
February	14.13	13.63	15.75	12.50	13.56	15.50	12.06	10.75	12.13	10.50	9.56	14.75	21.50	30.25	15.06	25.00
March	14.45	13.00	16.00	11.44	12.13	15.00	12.15	10.94	12.08	9.81	9.63	16.50	23.70	29.87	15.63	24.25
April	14.38	13.50	15.75	11.05	12.35	14.44	11.75	11.56	12.50	9.80	9.15	16.50	27.00	28.75	16.41	23.75
May	12.55	13.70	15.60	10.62	13.44	13.56	10.50	12.05	11.25	9.69	9.37	15.94	28.70	28.80	15.62	23.00
June	11.95	13.13	16.25	11.62	14.50	13.15	10.38	12.12	10.44	9.75	9.44	14.80	36.50	29.00	16.69	22.95
July	12.75	13.13	16.12	11.75	14.06	12.38	10.69	11.69	10.50	9.75	10.40	14.50	33.00	29.00	19.40	24.13
August	13.15	14.10	15.10	12.88	15.00	12.25	11.05	12.25	10.56	9.69	11.56	15.25	29.60	29.00	20.88	25.35
September	14.38	16.50	14.75	13.00	16.00	12.25	10.70	12.81	10.06	9.19	11.75	16.06	31.25	29.00	19.10	24.81
October	14.50	16.60	14.70	13.45	16.43	12.25	10.00	13.95	10.00	8.50	11.75	16.81	26.00	29.00	18.25	21.50
November	15.20	17.50	12.63	14.88	16.00	12.25	9.75	13.69	9.56	8.06	13.44	20.60	27.60	28.50	20.88	18.45
December	15.25	17.13	11.50	15.17	16.00	12.10	10.25	12.88	9.00	8.43	15.63	23.00	28.37	22.75	21.80	16.20

Old Steel Rerolling Rails, per Gross Ton

January	$16.00	$16.50	$19.00	$12.30	$15.81	$18.00	$13.69	$13.00	$16.15	$11.10	$9.62	$17.06	$27.00	$35.00	$22.10	$34.25
February	15.13	16.25	19.00	13.00	15.12	18.00	13.63	12.80	15.50	11.81	9.87	17.06	27.00	35.00	16.44	34.38
March	15.30	15.70	19.00	12.19	13.06	17.80	13.65	12.75	15.00	11.56	10.25	17.65	28.00	34.75	16.38	32.80
April	15.44	15.75	18.50	12.60	13.20	17.69	13.44	12.88	14.63	11.50	10.25	18.00	32.62	33.50	17.55	32.63
May	14.06	16.00	18.60	12.94	14.44	17.12	13.49	13.50	13.95	11.31	10.25	17.38	36.50	34.00	17.75	31.75
June	12.95	15.88	18.94	13.94	15.50	16.50	12.38	13.50	12.69	11.50	10.25	15.85	46.90	34.00	18.75	32.65
July	13.56	15.50	18.00	14.50	15.40	15.88	12.25	13.50	12.25	11.50	10.30	15.25	45.19	34.00	25.15	35.00
August	14.35	15.90	17.00	15.63	16.12	15.31	12.65	14.00	12.12	11.50	12.25	15.80	39.20	34.00	29.50	38.00
September	15.25	17.63	16.75	16.18	17.15	15.25	12.75	15.00	12.25	10.75	13.35	17.06	39.75	34.00	26.80	38.13
October	15.63	18.63	17.15	15.80	18.00	15.25	12.44	16.30	12.15	10.00	13.31	18.81	34.75	34.00	27.19	33.44
November	16.30	21.15	15.06	17.19	18.00	15.06	12.30	16.50	12.00	9.50	14.44	24.50	34.80	33.50	31.25	22.90
December	16.50	21.00	12.94	16.95	18.00	14.20	12.50	16.50	11.33	9.50	16.63	28.63	35.25	27.50	31.90	16.90

Old Iron Rails, per Gross Ton

January	$21.13	$23.00	$27.40	$15.60	$18.81	$20.00	$15.00	$15.19	$17.05	$13.00	$11.38	$17.50	$27.00	$37.80	$28.10	$30.00
February	20.00	21.75	25.50	17.12	18.25	19.25	15.25	15.25	16.25	13.13	11.63	17.56	27.00	38.00	22.75	33.50
March	19.60	20.75	25.00	15.44	16.94	19.00	15.35	15.31	16.25	12.94	12.00	17.40	27.60	38.50	21.50	33.10
April	19.75	20.88	24.88	15.00	16.10	18.50	14.69	15.56	16.19	12.75	11.85	18.00	31.25	38.00	22.10	33.50
May	18.50	21.25	24.50	14.81	16.63	17.62	14.69	16.25	15.90	12.75	12.39	17.60	34.10	38.00	21.50	34.00
June	17.15	21.25	24.50	15.50	17.00	17.00	14.38	16.25	14.75	12.75	12.25	18.13	45.00	38.00	21.50	34.50
July	17.81	21.25	23.75	15.90	17.00	16.75	14.25	16.25	14.00	12.15	12.25	18.50	44.37	38.75	23.30	34.50
August	19.35	21.90	20.65	16.56	18.38	16.25	14.25	16.30	14.00	12.00	12.25	18.55	41.30	39.00	26.00	35.90
September	20.88	23.50	20.25	17.35	19.20	16.00	14.50	16.88	14.00	11.70	13.25	19.00	43.37	39.00	24.70	35.94
October	22.13	26.00	20.05	18.00	20.75	16.00	13.88	17.95	13.90	11.13	13.50	20.44	36.00	39.00	24.25	34.38
November	22.90	28.00	17.63	18.38	20.62	16.00	14.75	18.25	13.50	11.00	14.94	24.00	35.10	38.50	26.88	28.85
December	23.00	28.00	15.50	19.50	20.00	15.70	15.00	17.68	13.16	11.00	16.00	28.50	37.00	34.25	28.10	25.80

No. 1 Railroad Wrought, per Net Ton

January	$18.19	$17.30	$16.35	$11.20	$13.81	$14.88	$11.75	$11.63	$12.70	$8.70	$8.69	$15.88	$23.50	$31.25	$19.10	$26.00
February	17.00	15.88	15.50	12.44	12.88	14.69	12.00	11.30	12.19	9.50	8.87	14.94	23.75	31.25	15.13	27.00
March	16.40	14.88	15.25	11.25	11.43	14.45	12.30	11.44	12.13	9.06	9.00	16.20	25.90	30.75	15.88	27.10
April	16.06	14.50	15.25	11.00	11.90	14.19	11.69	12.31	12.38	9.00	8.65	17.00	30.35	30.20	16.05	27.25
May	14.19	14.50	15.45	10.75	12.81	12.87	11.38	12.75	11.25	9.00	8.94	16.50	32.60	29.75	15.69	26.38
June	13.50	13.50	16.06	11.69	13.38	12.75	11.25	12.57	10.56	9.00	9.00	15.20	41.00	29.75	16.87	25.25
July	14.13	13.50	15.06	12.15	13.16	12.44	11.00	12.06	10.55	9.00	9.15	14.94	37.75	29.75	18.60	24.88
August	15.45	14.50	14.40	12.69	14.44	11.94	11.10	12.50	10.62	8.94	10.44	15.30	33.70	29.75	20.75	24.75
September	16.31	16.13	14.38	13.44	15.35	11.94	10.94	13.13	10.19	8.37	11.00	16.38	35.50	29.75	19.50	23.88
October	17.00	17.50	14.60	13.60	15.94	11.75	10.44	14.25	9.60	7.87	11.19	17.50	28.75	30.36	19.38	20.25
November	17.50	18.00	12.32	14.38	15.31	11.94	10.20	13.50	9.00	7.56	12.94	21.00	30.90	28.68	22.88	16.85
December	18.00	17.25	11.00	14.83	14.75	11.65	10.75	13.06	8.50	7.90	15.38	25.13	31.25	24.62	24.10	14.60

Heavy Cast Scrap, per Net Ton

January	$13.81	$14.70	$17.80	$12.95	$13.06	$14.88	$12.19	$11.25	$12.90	$10.20	$9.19	$13.31	$15.50	$25.90	$22.95	$37.25
February	13.13	13.50	18.25	13.00	12.75	14.88	12.13	11.25	12.69	10.87	9.00	12.81	15.37	26.06	20.00	38.88
March	13.40	12.75	19.50	12.12	12.19	14.50	12.25	11.31	12.50	10.37	9.00	13.45	16.90	27.25	21.63	37.85
April	13.81	12.94	18.88	12.05	12.60	13.69	11.81	12.06	12.44	10.25	9.00	12.88	20.43	27.12	21.45	37.25
May	12.50	13.40	18.55	11.50	13.31	13.13	11.00	12.20	11.60	10.06	9.00	12.56	23.20	26.70	20.12	37.38
June	12.40	13.50	18.94	12.00	13.81	13.00	10.75	11.81	10.63	9.75	9.00	11.75	30.00	27.12	20.75	36.30
July	13.38	13.50	18.44	12.15	13.44	13.00	10.50	11.75	10.70	9.65	9.25	11.50	29.25	28.06	23.30	36.50
August	13.20	14.00	16.75	12.75	14.06	12.75	10.55	12.15	10.87	9.50	9.62	11.50	24.20	29.10	24.50	36.20
September	13.38	15.38	16.81	12.88	14.75	12.75	10.10	12.81	10.62	9.19	10.10	12.13	23.75	30.00	24.20	34.00
October	13.63	15.90	16.25	13.25	15.63	12.50	10.25	14.20	10.40	9.00	10.50	13.50	20.50	30.36	25.00	28.75
November	14.30	17.50	14.00	13.75	15.12	12.50	10.35	13.50	10.06	8.56	12.13	15.55	22.00	28.87	28.12	23.00
December	15.00	17.50	13.00	13.92	14.75	12.30	11.00	13.25	9.83	9.00	13.75	16.25	23.50	25.75	32.35	18.70

Railroad Malleable Scrap, per Net Ton

January	$14.06	$15.00	$17.20	$10.40	$12.88	$15.00	$10.94	$10.88	$13.40	$9.25	$8.13	$13.81	$17.75	$26.80	$17.60	$29.00
February	13.69	14.25	16.00	11.31	12.38	14.69	10.50	10.30	13.00	10.38	8.00	13.33	17.31	26.80	14.87	29.94
March	13.44	13.00	16.25	10.00	11.50	14.50	11.00	10.44	13.00	9.56	7.94	13.95	17.95	27.89	16.13	28.50
April	13.25	13.38	16.38	10.10	11.25	13.69	11.00	11.19	13.19	9.15	8.00	13.89	20.37	28.25	15.80	27.63
May	12.38	13.50	16.25	9.81	12.38	12.94	10.38	11.55	12.10	9.13	8.14	13.44	23.30	29.30	15.25	26.50
June	11.90	13.50	17.50	10.25	12.94	12.20	10.10	11.75	11.06	9.00	8.13	11.73	31.62	29.50	16.00	25.65
July	12.31	13.38	16.75	11.40	12.75	11.25	10.00	11.75	10.60	9.00	8.90	11.63	30.12	29.71	18.70	27.00
August	13.15	13.60	16.00	12.06	13.69	11.00	10.05	12.05	10.38	8.88	10.00	11.25	29.70	30.36	20.50	28.75
September	14.19	15.00	16.00	12.38	15.15	11.20	10.00	12.56	10.19	8.25	10.25	11.50	30.75	30.36	18.95	27.63
October	14.25	15.13	16.20	12.45	15.25	11.00	9.69	13.75	9.65	7.90	10.25	12.38	25.25	30.36	19.06	23.50
November	14.55	17.30	12.25	13.44	15.13	11.25	9.50	13.56	9.31	7.75	11.38	16.00	25.60	29.18	23.12	19.45
December	15.00	18.00	10.50	13.70	14.95	11.25	10.06	13.50	9.00	7.95	13.75	18.00	27.35	22.75	25.70	15.00

Frogs, Switches and Guards, Cut Apart, per Gross Ton

January	$14.88	$15.00	$17.40	$11.40	$14.00	$16.00	$11.50	$10.50	$12.65	$9.30	$9.19	$15.50	$21.60	$30.00	$17.40	$24.50
February	14.06	14.75	16.25	12.38	13.56	15.50	11.88	10.50	12.13	10.50	9.86	14.75	21.69	29.75	15.06	25.00
March	14.50	13.70	16.50	11.69	12.50	15.00	12.10	10.88	12.13	9.81	9.63	16.50	23.70	29.87	15.38	24.25
April	14.25	13.50	16.50	11.50	12.55	14.50	11.63	11.38	12.44	9.90	9.15	16.50	26.75	29.00	16.15	23.75
May	13.31	13.70	16.90	11.56	13.44	13.69	10.38	11.80	11.30	9.69	9.38	15.94	28.70	29.00	15.63	23.00
June	12.10	13.13	17.25	11.63	14.50	13.15	10.20	11.88	10.44	9.69	9.44	14.63	36.50	29.00	16.69	22.95
July	12.75	13.25	16.81	12.30	14.15	12.38	10.44	11.56	10.50	9.75	10.45	14.50	33.00	29.00	19.40	24.13
August	13.15	14.30	15.50	14.00	14.88	12.25	10.70	11.95	10.56	9.69	11.56	15.25	29.60	29.00	20.88	25.35
September	14.38	16.63	15.50	13.63	15.95	12.25	10.38	12.63	10.19	9.19	11.75	16.06	31.25	29.00	19.10	24.81
October	14.50	17.13	15.30	13.85	16.63	12.25	9.94	13.75	10.00	8.75	11.75	16.81	26.00	29.00	18.25	21.38
November	15.40	18.30	12.69	14.50	16.06	12.25	9.65	13.44	9.56	8.19	13.44	20.95	27.60	28.00	20.88	18.45
December	15.50	18.00	11.63	14.95	16.00	12.10	10.13	12.63	9.00	8.40	15.63	23.25	28.37	22.75	21.80	16.20

Old Carwheels, per Gross Ton

January	$16.56	$19.00	$24.90	$20.10	$15.75	$18.38	$13.00	$13.25	$16.95	$11.65	$9.94	$14.63	$18.87	$30.00	$25.90	$36.13
February	16.38	19.00	23.50	16.94	15.25	17.88	13.00	13.05	16.75	12.44	10.00	13.94	18.25	30.00	22.75	38.06
March	15.75	18.60	23.88	15.50	14.69	17.00	13.25	13.00	16.75	11.88	9.94	14.30	20.25	30.00	21.50	36.20
April	15.88	18.75	25.00	14.00	14.50	16.50	13.25	13.25	16.75	11.55	9.75	13.88	23.62	29.00	21.50	37.50
May	14.81	19.00	25.20	12.88	14.81	15.75	12.75	13.90	15.05	11.50	9.75	12.95	27.35	29.00	21.25	37.50
June	14.25	18.00	25.38	13.00	15.81	15.50	12.55	14.13	13.94	11.50	10.19	12.44	39.00	29.00	22.00	35.90
July	14.38	18.00	24.25	13.30	16.00	14.81	12.50	13.88	12.90	11.25	11.30	12.50	35.25	29.00	23.95	35.75
August	14.95	18.50	24.50	15.50	16.25	14.50	12.85	13.70	12.75	11.25	11.04	11.60	30.40	29.00	26.25	38.35
September	15.75	19.75	24.50	15.50	18.05	14.00	12.81	14.38	12.63	11.06	11.80	11.69	31.87	29.00	24.90	37.69
October	16.00	19.31	24.38	15.25	18.31	14.00	12.50	16.00	12.10	10.65	12.00	12.94	25.75	29.00	24.88	36.06
November	17.10	22.60	23.13	15.50	18.50	13.50	12.10	16.69	12.00	9.81	13.31	17.30	28.15	29.00	28.63	31.95
December	18.75	25.00	22.00	16.00	18.50	13.50	13.06	16.75	11.88	9.60	14.56	21.25	31.00	26.75	31.10	24.40

The Status of the Electric Steel Industry

United States Leads in Output with 356 Furnaces, a Gain of 10 Per Cent in 1920—Furnaces in World's Steel Industry Estimated at 961

BY EDWIN F. CONE

WHILE the expansion in the electric steel industry of the United States and Canada was not as large in 1920 as in 1919, so far as new installations are concerned, the increase was a satisfactory and healthy one. By no means has the industry come to a standstill despite the rapid growth in the war years. In other countries data are still difficult to obtain because of the confusion and rearrangement of industries and countries due to the war, but in this review some definite data have been secured which are of decided value.

On Jan. 1, 1920, according to THE IRON AGE'S annual review of the electric steel industry published in the issue of Jan. 1, 1920, the United States was credited with 323 furnaces of all types, with 40 in Canada. On Jan. 1, 1921, this total has been increased to 356 in this country and 43 in Canada. There were only 19 such furnaces in this country and 3 in Canada on July 1, 1913, or eight and one-half years ago. The total in the world on Jan. 1, 1920, was estimated very roughly at about 815. The combined actual and estimated data as of Jan. 1, 1921, show about 961 furnaces of all types in the world's electric steel industry. The total may actually reach 1000 at the present time.

A review of this industry was inaugurated by THE IRON AGE, the first data appearing in the issue of July 1, 1913. The first estimate of this nature appeared in *Stahl und Eisen* which THE IRON AGE amplified for its issue of April 14, 1910. This review has appeared annually in each Annual Review Number beginning in January, 1915.

The review which follows gives complete data to date as to every type of furnace, concerning which it has been possible to obtain information, and the product, both in the United States and Canada. The Moore and Volta furnaces are the only exceptions, the companies selling these types supplying no data. The information is particularly accurate as to the United States and nearly complete as to Canada. It has been possible to compile a partially complete table as to the world which is presented in a different form than heretofore. It is hoped to make this more accurate a year from now.

Progress in the United States and Canada

The net increase in the number of electric furnaces in the United States in 1920 has been 33 against 36 in 1919; 54 in 1918; 97 in 1917 and 63 in 1916. The total is now 356 against 323 on Jan. 1, 1920; 287 on Jan. 1, 1919; 233 on Jan. 1, 1918 and 136 on Jan. 1, 1917. The apparent net increase of 33 in the last year is less than the actual, due to cancellations of contracts during the year or to the passing out of commission of some installations. The expansion of the industry is appreciated when it is recalled that there were only 19 furnaces of all types in the United States on July 1, 1913.

In Canada the industry is virtually at a standstill. Although the gain the last year has been three furnaces, the total is no larger than it was on Jan. 1, 1919, or 43 furnaces. On Jan. 1, 1917, there were only 19 furnaces in Canada and only 3 on July 1, 1913.

The increase in the two countries has been 36 in 1920 against 33 in 1919 or from 363 on Jan. 1, 1920, to 399 on Jan. 1, 1921.

Table of Rennerfelt Electric Steel Furnaces Installed or Contracted for in the United States, Jan. 1, 1921, as Sold by Hamilton & Hansell, New York

Company and Location	Capacity, Lb.	Product
American Foundry & Machine Co., Salt Lake City, Utah	6600	Castings
Best Steel Castings Co., Oakland, Cal.	2200	Castings
The Parsons Co., Newton, Iowa	2200	Castings
Pacific Foundry Co., San Francisco, Cal.	750	Pig iron
Chile Exploration Co., New York City	1000	Testing
Hamilton & Hansell, New York City	500	Special testing
Oklahoma Iron Works, Tulsa, Okla.	2200	Castings
Philadelphia Electric Steel Co., Conshohocken, Pa.	2200	Castings
Simonds Steel Co., Lockport, N. Y.	500	Testing
Liberty Steel Co., Morristown, N. J.	1000	Alloy steel
A. M. Byers Co., Pittsburgh	1000	Alloy steel
United States High Speed Steel & Tool Corporation	1000	Alloy steel
United States High Speed Steel & Tool Corporation	1000	Alloy steel
United States High Speed Steel & Tool Corporation	500	Alloy steel
Haynes Stellite Co., Kokomo, Ind.	200	Nichrome
Driver-Harris Co., Harrison, N. J.	300	Nichrome
Hardite Metals Co., Long Island City, N. Y.	1000	Nichrome

Total in the United States, 17.

Besides these there are 11 Rennerfelt furnaces operating in the United States and 1 in Canada in the non-ferrous industry.

Table of Gronwall-Dixon Electric Steel Furnaces Installed or Contracted for in the United States and Canada on Jan. 1, 1921, as Sold by the John A. Crowley Co., New York

Company and Location	Size, Tons	No. of Furnaces	Product
The John A. Crowley Co., Detroit, Mich.	12	1	Ingots
The John A. Crowley Co., Detroit, Mich.	6	1	Ingots
Old Dominion Iron & Nail Works Co., Richmond, Va.	6	1	Ingots
Norfolk & Western Railroad, Roanoke, Va.	3	1	Castings
Witherow Steel Co., Neville Island, Pa.	12	1	Ingots
Jessop Steel Co., Washington, Pa.	3	1	Ingots
Calumet & Hecla Mining Co., Calumet, Mich.	3	1	Castings
Armstrong Steel Foundry Co., Huntington, Ind.	3	1	Castings
Hartford Electric Steel Corp., Hartford, Conn.	3	1	Castings
Ford Motor Co., Detroit, Mich.	¼	1	Castings
Cleveland Brass Mfg. Co., Cleveland	¾	1	Alloy steel castings
Bowmanville Foundry Co., Bowmanville, Ont.	¼	1	Castings

Total in the United States, 11; in Canada, 1.

Table of Greene Electric Steel Furnaces Installed or Contracted for in the United States and Canada, Jan. 1, 1921, as Sold by the Greene Electric Furnace Co., Seattle, Wash.

Company and Location	Size, Tons	No. of Furnaces	Product
Dayton Malleable Iron Co., Dayton, Ohio	2½	1	Iron and stee
Tannent Steel & Iron Co., Tacoma, Wash.	½	2	Steel
Pacific Car & Foundry Co., Renton, Wash.	1½	1	Steel
Lamb Machine Co., Hoquian, Wash.	1½	1	Iron and steel
Aurora Foundry Co., Seattle, Wash.	2	1	Iron and steel
Everett Steel Co., Everett, Wash.	¾	1	Steel
Olympic Steel Works, Seattle, Wash.	1	1	Steel
Olympic Steel Works, Seattle, Wash.	2½	1	Steel
Vulcan Mfg. Co., Seattle, Wash.	1½	1	Iron and Steel
Capitol City Iron Works, Olympia, Wash.	1½	1	Steel
Canadian Klondike Mining Co., Dauson, Y. T.	3	1	Steel
Joplin Steel & Malleable Co., Joplin, Mo.	3	1	Iron and steel
Standard Brake Shoe & Foundry Co., Pine Bluff, Ark.	2	1	Steel
Skagit Steel & Iron Works, Sedro Wooley, Wash.	1½	1	Steel and iron
Hanford Iron Works, San Bernardino, Cal.	2	1	Steel
Special induction furnaces*		2	

Total in the United States, including Alaska 18.

*These are two furnaces concerning which further information is not yet available.

The table Heroult furnaces this year gives all those that are now in existence or licensed to operate by the United States Steel Corporation up to Jan. 1, 1921. The total of this type on Jan. 1, 1921, was 159 in the United States and 18 in Canada as contrasted with 152 and 18 respectively on Jan. 1, 1920. This is a net gain last year of 7 furnaces, all in the United States; the

Table of Heroult Electric Furnaces, Installed or Contracted for, as Licensed by United States Steel Corporation, in the United States and Canada, Jan. 1, 1921.

Company and Location	No. of Furnaces	Size, Tons	Product
Alaska-Treadwell Gold Mining Co., Treadwell, Alaska	1	2	Castings
American Manganese Steel Co., Oakland, Cal.	1	3	Castings
American Manganese Steel Co., Chicago	2	3	Castings
American Manganese Steel Co., Chicago	1	6	Castings
American Steel Foundries, Indiana Harbor, Ind.	1	6	Castings
Anniston Steel Co., Anniston, Ala.	5	6	Castings and pig iron
Armstrong, Whitworth of Canada, Ltd., Longueil, Que.	1	3	Ingots
Armstrong, Whitworth of Canada, Ltd., Longueil, Que.	3	6	Ingots
Atlas Crucible Steel Co., Dunkirk, N. Y.	1	3	Ingots
Atlas Crucible Steel Co., Dunkirk, N. Y.	2	6	Ingots
Atlantic, Gulf & Pacific Co., Manila, Pa.	1	1	Castings
Baldwins Canadian Steel Corporation, Ltd., Toronto, Can.	10	6	Ingots
Belle City Malleable Iron Co., Racine, Wis.	1	3	Castings
Best Steel Casting Co., Oakland, Cal.	1	6	Castings
Bethlehem Steel Co., Bethlehem, Pa.	1	3	Castings
Bethlehem Steel Co., Bethlehem, Pa.	1	6	Ingots
Braeburn Steel Co., Braeburn, Pa.	2	6	Ingots
Buchanan Electric Steel Co., Buchanan, Mich.	1	2	Castings
Buchanan Electric Steel Co., Buchanan, Mich.	1	3	Castings
Buckeye Steel Casting Co., Columbus, Ohio	1	6	Castings
Carbon Steel Co., Pittsburgh	1	6	Ingots
Carpenter Steel Co., Reading, Pa.	4	6	Ingots
Connecticut Electric Steel Co., Inc., Hartford, Conn.	2	2	Castings
Crane Co., Chicago, Ill.	1	6	Castings
Crucible Steel Casting Co., Cleveland, Ohio	1	1	Castings
Crucible Steel Casting Co., Lansdowne, Pa.	1	2	Castings
Crucible Steel Co. of America, Atha Works, Harrison, N. J.	1	3	Ingots
Crucible Steel Co. of America, Atha Works, Harrison, N. J.	3	6	Ingots
Crucible Steel Co. of America, Park Works, Pittsburgh	2	6	Ingots
Crucible Steel Co. of America, Sanderson Works, Syracuse, N. Y.	2	3	Ingots
Damascus Crucible Steel Casting Co., New Brighton, Pa.	1	2	Castings
Disston, Henry, & Sons, Inc., Philadelphia	1	3	Ingots
Disston, Henry, & Sons, Inc., Philadelphia	1	6	Ingots
Dominion Foundries & Steel, Ltd., Hamilton, Can.	2	6	Castings
Driscoll-Reese Steel Co., Hamburg, Pa.	1	1	Castings
Driver-Harris Co., Harrison, N. J.	2	2	Castings
Electric Alloy Steel Co., Charleroi, Pa.	1	6	Castings
Electric Steel & Forge Co., Cleveland	1	6	Ingots
Electric Steel Co. of Indiana, Indianapolis, Ind.	1	3	Castings
Electric Steel & Metals Co., Ltd., Welland, Can.	2	6	Ingots
Firth-Sterling Steel Co., McKeesport, Pa.	2	3	Ingots
Fort Pitt Steel Casting Co., McKeesport, Pa.	1	3	Castings
General Electric Co., Schenectady, N. Y.	1	5	Castings
General Electric Co., Schenectady, N. Y.	2	2	Castings
General Electric Co., Schenectady, N. Y.	1	1	Castings
General Electric Co., West Lynn, Mass.	1	6	Castings
General Electric Co., Erie, Pa.	1	6	Castings
General Electric Co., Pittsfield, Mass.	1	1	Experimental products
Halcomb Steel Co., Syracuse, N. Y.	1	4	Ingots
Halcomb Steel Co., Syracuse, N. Y.	3	6	Ingots
Harrow Spring Co., Kalamazoo, Mich.	1	6	Ingots
Heppenstall Forge & Knife Co., Pittsburgh	2	6	Ingots
Hess Steel Corporation, Baltimore, Md.	6	6	Ingots
Hub Electric Steel Casting Co., Boston, Mass.	1	2	Castings
Latrobe Electric Steel Co., Latrobe, Pa.	1	3	Ingots
Latrobe Electric Steel Co., Latrobe, Pa.	2	6	Ingots
Lebanon Steel Foundry, Lebanon, Pa.	2	2	Castings
Lemoyne Steel Co., Monongahela, Pa.	1	2	Ingots
Llewelyn Iron Works, Los Angeles, Cal.	1	3	Castings
Lunkenheimer Co., Cincinnati	1	1	Castings
Michigan Steel Casting Co., Detroit, Mich	1	6	Castings
Michigan Steel Casting Co., Detroit, Mich.	2	3	Castings
Midvale Steel & Ordnance Co., Nicetown, Phila., Pa.	1	6	Ingots
Millbury Steel Foundry Co., Millbury, Mass.	1	2	Castings
Milton Mfg. Co., Milton, Pa.	1	3	Castings
Milwaukee Steel Foundry Co., Milwaukee, Wis.	1	3	Castings
Monarch Foundry Co., Stockton, Cal.	1	1	Castings
National Malleable Casting Co., Sharon, Pa.	2	6	Castings
National Malleable Casting Co., Grant Works, Chicago	3	6	Castings
National Malleable Casting Co., Cleveland	2	15	Castings
Newport News Shipbuilding & Dry Dock Co., Newport News, Va.	1	6	Castings
Ontario Electric Steel Co., Fulton, N. Y.	1	1	Ingots
Ontario Electric Steel Co., Fulton, N. Y.	1	6	Ingots
Pennsylvania Engineering Works, Newcastle, Pa.	1	6	Castings
Pettibone-Mulliken Co., Chicago	1	2	Castings
Railway Steel Spring Co., Latrobe, Pa.	1	3	Ingots
Simonds Manufacturing Co., Lockport, N. Y.	2	6	Ingots
Sizer Forge Co., Buffalo, N. Y.	2	10	Ingots
Southern California Iron & Steel Co., Los Angeles, Cal.	1	6	Ingots
Southern Pacific Co., Sacramento, Cal.	1	6	Ingots and castings
Spencer Heater Co., Scranton, Pa.	1	3	Castings
Standard Seamless Tube Co., Economy, Pa.	1	15	Ingots
Standard Stoker Co., Erie, Pa.	1	2	Castings
Taylor, W. P., Co., Buffalo, N. Y.	1	2	Castings
Taylor-Wharton Iron & Steel Co., Highbridge, N. J.	1	3	Castings
Taylor-Wharton Iron & Steel Co., Easton, Pa.	1	6	Castings
Timken-Detroit Axle Co., Canton, Ohio	1	2	Castings
Timken Roller Bearing Co., Canton, Ohio	4	6	Ingots
Treadwell Engineering Co., Easton, Pa.	1	2	Castings
Trojan Electric Steel Co., Chicago, Ill.	1	1	Ingots
Tungsten Steel Co., Toledo, Ohio	1	¼	Cast tool
Twin City Forge & Foundry Co., Stillwater, Minn.	1	3	Castings
Union Electric Steel Co., Carnegie, Pa.	1	6	Ingots
Union Spring & Manufacturing Co., New Kensington, Pa.	1	6	Castings
United Alloy Steel Corporation, Canton, Ohio	1	6	Ingots
United Alloy Steel Corporation, Canton, Ohio	2	15	Ingots
U. S. Government, Watertown Arsenal, Watertown, Mass.	1	2	Castings
U. S. Government, Watertown Arsenal, Watertown, Mass.	2	6	Ingots
U. S. Government, Naval Gun Factory, Washington, D. C.	1	6	Castings
U. S. Government, Naval Projectile Factory, Charleston, W. Va.	3	6	Ingots
U. S. Government, Naval Ordnance Factory, Charleston, W. Va.	2	35	Ingots
United States Naval Ordnance Factory, Charleston, W. Va.	1	1	Tool steel and experimental
United States Steel Corporation, South Chicago, Ill.	1	15	Castings
United States Steel Corporation, South Chicago, Ill.	1	15	Ingots
United States Steel Corporation, South Chicago, Ill.	3	25	Ingots
United States Steel Corporation, Joliet, Ill.	1	4	Molten Ferro Manganese
United States Steel Corporation, Duquesne, Pa.	1	25	Ingots
United States Steel Corporation, Ensley, Ala.	1	6	Molten Ferro Manganese
Universal Rolling Mill Co., Bridgeville, Pa.	3	6	Ingots
Vanadium Alloys Steel Co., Latrobe, Pa.	2	3	Ingots
Vulcan Crucible Steel Co., Aliquippa, Pa.	2	3	Ingots
Warman Steel Castings Co., Los Angeles, Cal.	2	3	Castings
Warren Steel Casting Co., St. Louis, Mo.	1	2	Castings
Warren Steel Casting Co., St. Louis, Mo.	1	3	Castings

Summary:	Furnaces
Total in the United States, including Alaska	159
Total in Canada	18
Total in the United States and Canada	177

actual gain was larger, due to cancellations or other changes during the year. As heretofore the Heroult furnace maintains its leadership in installations and output.

The following data, furnished by the Steel Corporation, is of interest as giving a summation of the functioning of the Heroult furnace:

Furnaces used for making ingots	103
Furnaces used for making castings	74
Total	177
Furnaces melting cold scrap	147
Furnaces refining molten metal	8
Furnaces melting or refining	14
Furnaces making malleable iron	5
Furnaces making low phosphorus iron	3
Furnaces melting ferromanganese	2
Total	179
Number of quarter-ton furnaces	1
Number of one-ton furnaces	10
Number of two-ton furnaces	22
Number of three-ton furnaces	35
Number of four-ton furnaces	2
Number of five-ton furnaces	1
Number of six-ton furnaces	93
Number of 10-ton furnaces	2
Number of 15-ton furnaces	7
Number of 25-ton furnaces	4
Number of 35-ton furnaces	2
Total	179
Total gross tons per charge	1035.25 tons
Average gross tons per charge	5.95 tons
Average net tons per charge	6.66 tons

Most conspicuous in the progress of the American electric steel industry last year were the Greene and Greaves-Etchells types. Net sales of each of those have increased their total installations by 7 furnaces each. A year ago there were 17 Greaves-Etchells furnaces in the United States against 23 now with the total for Canada and the United States at 25 Jan. 1, 1921, against 18 on Jan. 1, 1920. Expansion of the Greene furnace has been larger on the Pacific Coast though its usefulness is gradually spreading eastward. On Jan. 1, 1920, there were 11 Greene furnaces in the

Table of Greaves-Etchells Electric Steel Furnaces Installed or Contracted for in the United States on Jan. 1, 1921, as Sold by the Electric Furnace Construction Co., Philadelphia

Company and Location	Size, Tons	No. of Furnaces	Product
U. S. Navy Yards at:			
Norfolk, Va.	6		Castings
Puget Sound, Wash.	6		Castings
Mare Island, Cal.	6		Castings
Charleston, S. C.	3		Castings
Philadelphia, Pa.	3		
Total		5	Castings
American Radiator Co., Buffalo, N. Y.	6	2	Castings
American Radiator Co., Buffalo, N. Y.	½	1	Castings
Halcomb Steel Co., Syracuse, N. Y.	3	2	Tool steel
Ford Motor Co., Detroit, Mich.	½	1	Castings
Ford Motor Co., Detroit, Mich.	3	1	Castings
Davidson Tool Mfg. Co., New York City	½	1	High speed steel
Hoskins Mfg. Co., Detroit, Mich.	½	1	Nichrome
Sullivan Machinery Co., Claremont, N. H.	1	1	Castings
Dodge Steel Castings Co., Philadelphia	3	1	Castings
Hammond Steel Co., Syracuse, N. Y.	3	1	Castings
Bird-Archer Co., New York	½	1	High speed steel
Brennan Steel Castings Co., Cleveland, O.	¼	1	Castings
Electric Steel Products Co., Turners Falls, Mass.	1	1	Castings
C. H. Wills & Co., Port Huron, Mich.	1	1	Refining iron
Wayne Steel & Iron Co., Pittsgurgh	1	1	Castings
Wayne Steel & Iron Co., Pittsburgh	900 kva	1	Special
Vancouver Engineering Works, Vancouver, B. C.	1	1	Castings
Joliette Castings & Forgings, Ltd., Joliette, Que.	1	1	Castings

Total in the United States, 23; Canada, 2.

There have laso been sold a ½-ton furnace to the Imperial Japanese Mint, Osaka, Japan; a 1-ton furnace to Brazilian Military Commission, and a furnace to the Sociedad Espanola de Construccion Naval, Madrid, Spain, for making ferroalloy.

United States; on Jan. 1, 1921, there were 18, including two special Greene induction furnaces, particulars concerning which are not yet available but which are awaited with interest.

Expansion in the installations of other types have either been small or nothing. A new furnace of small size but of decided interest and practical use is the

Table of Booth Electric Steel Furnaces Installed or Contracted for in the United States Jan. 1, 1921, as Sold by the Booth Electric Furnace Co., Chicago.

Company and Location	Size, Tons	No. of Furnaces	Product
Midland Electric Steel Co., Terre Haute, Ind.	3	1	Ingots and pig iron
Avery Co., Peoria, Ill.	1½	2	Castings
Duriron Castings Co.	¾	1	Castings
West Michigan Steel Foundry Co., Muskegon, Mich.	3	1	Castings
Queen City Foundry Co., Denver, Col.	¾	1	Castings
Monroe Steel Castings Co., Monroe, Mich.	1½	1	Castings
Four Wheel Drive Auto Co., Clintonville, Wis.	1½	1	Castings
Ecorse Foundry & Machine Co., Ecorse, Mich.	3	1	Castings
Consumers Steel Corporation, Chicago, Ill.	3	1	Tool steel
New England Steel Castings Co., East Longmeadow, Mass.	1½	1	Castings
Union Motor Truck Co., Bay City, Mich.	1½	1	Castings
Cincinnati Steel Castings Co., Cincinnati, Ohio	1½	1	Castings
Yale & Towne Mfg. Co., Stamford, Ct.	1½	1	Steel and malleable iron castings

Total in the United States, 14.

Von Schlegell repelling arc furnace as sold by the Industrial Electric Furnace Co., Chicago, sponsor for the Snyder furnace which is now classed as multi-phase or single-phase types. The Von Schlegell furnace was described in THE IRON AGE, Dec. 9, 1920. Only one of them is operating in the steel industry but about 6 are in use in the non-ferrous industry.

Data regarding the Moore electric furnace and one known as the Volta were not obtainable except from current news sources. Expansion in the case of the former has been good the total now being estimated at not less than 24 and perhaps as high as 30 in use in

Table of Snyder Multi-Phase and Single-Phase and of Von Schlegell Repelling Arc Type Electric Steel Furnaces Installed or Contracted for in the United States and Canada, Jan. 1, 1921, as Sold by the Industrial Electric Furnace Co., Chicago

Company and Location	Size, Tons	No. of Furnaces	Product
Snyder Multi-Phase:			
Dayton Steel Foundry Co., Dayton, Ohio	5	1	Steel
West Steel Casting Co., Cleveland	5	1	Steel
Joyce-Cridland, Dayton, Ohio	3	1	Steel
Zimmerman Steel Co., Bettendorf, Iowa	5	1	Steel
Atlantic Foundry Co., Akron, Ohio	3	1	Steel
Standard Steel Castings Co., Clearing, Ill.	5	2	Steel
Buckeye Traction Ditcher Co., Findlay, Ohio	1	1	Iron and Steel
Hubbard Steel Foundry Co., East Chicago, Ind.	5	1	Steel
Niagara Electric Steel Corporation, No. Tonawanda, N.Y.	1	1	Steel
Western Crucible Steel Cast. Co., Minneapolis, Minn.	3	1	Steel
The Denver Rock Drill Mfg. Co., Denver, Col.	¾	1	Steel
Industrial Steel Casting Co., Toledo, Ohio	2	1	Steel
Standard Steel Casting Co., Cleveland, Ohio	3	1	Steel
Chicago Steel Foundry Co., Chicago	3	1	Steel
W. K. Henderson Iron Works & Supply Co., Shreveport, La.	1½	1	Steel
Von Schlegell Repelling Arc Type:			
H. D. Stroud, Detroit, Mich.		1	Aluminum Steel
Synder Single Phase:			
Crucible Steel Casting Co., Milwaukee, Wis.	1	1	Steel
Dayton Steel Foundry Co., Dayton, Ohio	1	1	Steel
S. Fair & Son, Saginaw, Mich.	¾	1	Steel
Western Crucible Steel Casting Co., Minneapolis, Minn.	1	1	Steel
Monroe Steel Casting Co., Monroe, Mich.	1	1	Steel
Sivyer Steel Casting Co., Milwaukee, Wis.	1	1	Steel
Otis Elevator Co., Buffalo, N. Y.	5	1	Steel
Minneapolis Elec. Steel Cast. Co., Minneapolis, Minn.	¾	1	Steel
Gerlinger Steel Casting Co., Milwaukee, Wis.	¾	1	Steel
Amer. Well & Prospecting Co., Corsicana, Texas	¾	1	Steel
Otis Elevator Co., Buffalo, N. Y.	5	1	Steel
Haynes Stellite Co., Kokomo, Ind.	¾	3	Stellite
Niagara Elec. Steel Corp., No. Tonawanda, N. Y.	¾	1	Steel
Chile Exploration Co., New York, N. Y.	¾ & 1	2	Steel
Davidson Mfg. Co., Montreal, Canada	1	1	Steel
Electric Steel Co., Chicago, Ill.	1	1	Steel
Gerlinger Steel Casting Co., Milwaukee, Wis.	1	1	Steel
Manitoba Steel Foundry, Selkirk, Manitoba, Can.	3	1	Steel
Pelton Steel Co., Milwaukee, Wis.	1	2	Steel
New London Ship & Engine Co., Groton, Conn.	1	1	Steel
Stearnes Rogers Mfg. Co., Pueblo, Col.	¾	1	Steel
Electric Steel Co., Chicago, Ill.	3	1	Steel
Fairbanks Steam Shovel Co., Marion, Ohio	1	1	Steel
Beaumont Iron Works, Beaumont, Texas	1	1	Iron and Steel
W. K. Henderson Iron Works & Supply Co., Shreveport, La.	¾	1	Steel
United Alloy Steel Corp., Canton, Ohio	1	2	Aluminum Steel
Western Steel Car & Foundry Co., Hegewisch, Ill.	1	2	Steel
Oil Well Supply Co., Oil City, Pa.	¾	1	Steel
Fluid Compressed Steel Co., Keokuk, Iowa	1	1	Steel
Industrial Steel Castings Co., Toledo, Ohio	2	1	Steel
H. Lifchitz Brass Foundry & Machine Shop, Indianapolis, Ind.	¾	1	Steel

Total in the United States, 52: Canada 2.

Table of Electric Steel Furnaces Installed or Contracted for in the United States and Canada, Jan. 1, 1921, other than the Heroult, Snyder, Rennerfelt, Gronwall-Dixon, Greaves-Etchells, Greene and Booth Types

Company and Location	Size, Tons	No. of Furnaces	Type
Bethlehem Steel Co., South Bethlehem, Pa.	10	1	Girod
Washington Iron Works, Seattle, Wash.	3 & 1	2	Girod
Electric Steel Foundry, Portland, Ore.	1	2	Girod
Washington Steel & Ordnance Co., Washington, D. C.	1	1	Stassano
American Iron & Steel Mfg. Co., Lebanon, Pa.	20	2	Induction
General Electric Co., Pittsfield, Mass.	2	1	Induction
Ludlum Steel Co., Watervliet, N. Y.	10	3	Ludlum*
Metal Alloys, Inc.	5	3	Ludlum
Hammond Steel Co., Syracuse, N. Y.	10	1	Ludlum
McCord Mfg. Co., Chicago	6	2	Ludlum
American Cast Iron Pipe Co., Birmingham, Ala.	6	1	Ludlum
Omaha Structural Steel Works, Omaha, Neb.	2	1	Ludlum
Westinghouse Electric & Mfg. Co., Trafford, Pa.	6	1	Ludlum
Bonney-Floyd Co., Columbus, Ohio	3	1	Ludlum
Old Dominion Iron & Steel Corporation, Richmond, Va.	3	2	Webb
Hercules Steel Casting Co., Milwaukee, Wis.	6	1	Vom Baur†
Moreland Motor Truck Co., Los Angeles, Cal.	3	1	Vom Baur
Moreland Motor Truck Co., Los Angeles, Cal.	¼	1	Vom Baur
A Steel Casting Company, New York City	3	1	Vom Baur
Rhode Island Crucible Steel Co., Providence, R. I.	1½	1	Vom Baur
Michigan Steel Castings Co., Detroit, Mich	1	1	Detroit
Chrome Steel Works, Chrome, N. J.	1	1	Special
Tivani Electric Steel Co., Belleville, Ont.	3	1	Special
Hesse-Martin Iron Works, Portland, Ore.	1	1	Special

Total in United States and Canada: Girod, 5; Stassano, 1; Induction, 3; Ludlum, 13; Webb, 2; Vom Baur: 5; Special and Volta, 25. *Total*, 44.

*A Ludlum 3-ton furnace has been sold to the Consolidated Rolling Mills & Foundry Co., Inc., New York, for installation in Chile. There are also 9 Ludlum furnaces of special type making various ferroalloys for the Metal Alloys, Inc., Watervliet, N. Y. The Andes Electin Corporation, Coney Island, N. Y., also is using a special 3-phase Ludlum furnace for smelting tin ores.

†Four Vom Baur furnaces have been sold for installation in Japan, one 6-ton furnace to Le Flaive et Cie., St. Etienne, France, and one 3-5 ton furnace to Consolidated Rolling Mills & Foundries Co., Mexico City, Mexico, for castings.

this country and Canada. The following companies are understood to be credited with Moore furnaces: Queen City Foundry Co., Denver, Col., one 1½-ton furnace; Black Steel & Wire Co., Kansas City, Mo., one 3-ton furnace; Keystone Driller Co., Beaver Falls, Pa., one 1½-ton furnace; Acme Steel Co., Glassmere, Pa., one 3-ton furnace; Emery Steel Castings Co., Baltimore, Md., one 1½-ton furnace; Isaac G. Johnson & Co., Spuyten Dyvill, N. Y., one 3-ton furnace; Adirondack Steel Foundries, Watervliet, N. Y., one 3-ton furnace; Mack Mfg. Co., Houston, Texas, one 3-ton furnace.

The Volta furnace, sold by the Volta Mfg. Co., Welland, Ontario, is an outgrowth of the war. It is

Table of the Number of Electric Steel Furnaces in the United States and Canada

Type	U.S. Jan. 1, 1921	Canada, Jan. 1, 1921	U.S. and Canada, Jan. 1, 1921	U.S. and Canada, Jan. 1, 1920	U.S. and Canada, Jan. 1, 1919	U.S. and Canada, Jan. 1, 1918	U.S. and Canada Jan. 1, 1917
Heroult	159	18	177	170	163	146	84
Snyder and Von Schlegell	52	2	54	40	48	35	22
Rennerfelt	17	0	17	13	13	13	13
Greaves-Etchells	23	2	25	13	11	12	0
Gronwall-Dixon	11	1	12	13	13	13	9
Ludlum	13	0	13	12	11	6	5
Girod	5	0	5	5	5	5	4
Booth	14	0	14	12	11	4	0
Moore*	22	2	24	20	12	4	0
Induction	3	0	3	3	3	3	3
Webb	2	0	2	2	2	2	0
Stassano	1	0	1	1	1	1	1
Greene	18	0	18	11	8	1	1
Vom Baur	5	0	5	4	2	0	0
Wile	0	0	0	0	0	1	1
Detroit	1	0	1	1	0	0	0
Volta	2	8*	8				
Special*	8	10	20	24	27	24	12
Total	356	+ 43 =	399	363	330	269	155

*Estimated.

the furnace which was developed by Robert Turnbull, now general superintendent of the United States Ferro Alloy Corporation, Niagara Falls, N. Y. It is understood that the United States has been invaded by this furnace and that two are being installed near Pittsburgh. There are at least 6 of these furnaces in Canada and perhaps more, one having been recently sold to the Canadian Steel Foundries, Ltd., for its Point St. Charles plant, Montreal.

Developments in the World

For the first time since early in the war it is possible to give some definite data regarding developments in foreign countries or those outside the United States

and Canada. THE IRON AGE is in possession of a list of all the Heroult installations in those countries to date as well as data concerning the Rennerfelt, Greaves-Etchells, Snyder and Vom Baur. It has been impossible to present these in detail in this article but a table has been prepared which is based on these data. Part of this table contains the known installations of these five types in the various countries. These show a total of 53 Heroult furnaces in England, 28 in France, 17 in Germany, 10 in Austria and so on, of the Rennerfelt there are 38 in Sweden, the country of its origin and 14 in Norway, while of the Greaves-Etchells there are 38 in England, also the country where it originated.

There are therefore 131 Heroult furnaces in foreign countries with 179 in the United States and Canada, making 310 in the world. This is followed by 99 for the Rennerfelt and 90 for the Greaves-Etchells in the world. Outside of the United States and Canada there are 294 known installations covering four types with 268 others estimated bringing the total to 562 outside the United States and Canada. With the 399 in the latter two countries, the world's total is estimated at 961 against an estimate of 815 two years ago.

Of particular interest as to Germany is the use of one 30-ton Heroult furnace by the Dortmander Union and one 28-ton furnace by the Usines Deutscher Kaiser. The Heroult installations in England are none larger than 7-ton and one 10-ton at Sheffield, while in France all are 7-ton or less, except a 25-ton furnace at a plant in Caen, France.

Taking the world's industry as a whole, of the 961 furnaces estimated, the United States is credited with 399 or over 40 per cent. This total is more than the combined total of England, France and Germany to which are credited 150, 69 and 100 respectively or 319. Six years ago or on Jan. 1, 1915, the United States had only 41 furnaces out of 213 in the world or about 20 per cent. Germany led the world in this industry at that time with 46 furnaces to 41 in the United States. The gradual and healthy expansion in this industry in 1920 is an assurance that the United States will continue to hold the supremacy over Germany and all other countries which it wrested in 1916 and which it has held ever since both in number of furnaces and in production.

Table of Electric Steel Furnace Installations in the Countries of the World, Actual Data for Certain Types with Others Estimated

Country	FURNACES: Heroult	Rennerfelt	Greaves-Etchells	Snyder	Vom Baur	Known Installations	Other Types, Estimated	Totals
France	28	2	8	..	1	39	30	69
England	53	7	38	3	..	101	49	150
Germany	17	1	..	..	..	18	82	100
Austria (and Hungary)	10	1	..	..	..	11	9	20
Italy	4	..	4	..	..	8	42	50
Luxembourg	2	..	..	..	..	2	8	10
Russia	3	7	..	..	..	10	5	15
Switzerland	1	1	..	..	..	2	4	6
Spain	4	..	6	..	..	10	0	10
Belgium	2	..	1	..	..	3	2	5
Sweden	3	38	1	..	..	42	8	50
Norway	1	14	..	..	..	15	5	20
Japan	2	2	1	2	4	11	0	11
Roumania	1	..	..	..	..	1	0	1
Chile	..	1	..	1	..	2	3	5
Mexico	..	..	..	..	1	1	1	2
Finland	..	5	..	..	..	5	0	5
Denmark	..	3	..	..	..	3	0	3
Netherlands	..	2	..	..	..	2	0	2
Brazil	..	1	..	..	..	1	0	1
China	..	..	1	..	..	1	0	1
Australia	..	..	2	..	..	2	0	2
Other South America	..	..	3	..	..	3	0	3
India	..	..	..	1	..	1	0	1
Location not given	..	..	..	..	..	..	20	20
Totals	131	85	65	7	6	294	268	562

	Jan. 1, 1921	Jan. 1, 1920	Jan. 1, 1919	Jan. 1, 1918	Jan. 1, 1917	Jan. 1, 1916	Jan. 1, 1915	July 1, 1913	March, 1910
Total outside the U. S. and Canada	562*	...	...	464	316	222	170	118	101
United States	356	323	287	233	136	73	41	19	10
Canada	43	40	43	36	19	8	2	3	3
Total in the U. S. and Canada	399	363	330	269	155	81	43	22	13
Grand total in the world	961	...	815†	733	471	303	213	140	114

*Largely estimated.
†Obtained by adding the known new installations to the estimate for Jan. 1, 1918.

WAGE REDUCTIONS

Announcements Delayed at Youngstown—Working Forces of Independents Cut Sharply

YOUNGSTOWN, OHIO, Jan. 4.—Though a general wage reduction was anticipated in the iron and steel industry in the Mahoning Valley effective Jan. 1, it failed to materialize. There is no inclination on the part of the independents to act with Steel Corporation plants in maintaining current wage rates, and reductions in the near future are regarded as a certainty, inasmuch as competing interests in other sections have already acted. Liquidation of working forces is proceeding at a rapid rate, though the major interests have succeeded to date in maintaining partial employment in practically all departments. Employees of the Carnegie Steel Co. district plants have as yet been virtually unaffected by the decline in business which has retarded independent schedules.

Fabricating interests have maintained their operating forces intact, to a large extent. Two chief interests at Warren, Ohio, have been steadily adding to their working staffs, hiring chiefly skilled workers.

The most drastic curtailment in the Valley has been made by the Trumbull Steel Co., which has reduced its forces to minimum and is evidently preparing for a somewhat protracted period of curtailed operations. Many positions have been abolished, while stenographic and clerical help has been greatly reduced.

Whether other large independent employers will follow this action in January or not depends altogether upon the volume of new business. Manufacturers assert they will strive to spread out the work as far as possible, even at a loss, though they point out the limitations upon such a policy, especially if inactivity in the buying market is prolonged.

Wage Reductions and Time Changes

The Pullman Co. reduced wages 20 per cent at its car manufacturing plant, Pullman, Ill., effective Jan. 1. When the industrial relations committee of the works was notified that a cut in wages was necessary, it reported back the willingness of the workers to accept the reduction. Later two thousand union men, representing about 35 per cent of the force, met and voted unanimously not to accept the reduction.

Effective Jan. 1 the William B. Pollock Co., fabricating interest of Youngstown, Ohio, instituted a five-day week at its works and abolished overtime wages, hitherto paid at the rate of time and a half for all over eight hours. Usual working shifts will be maintained.

The United States Cast Iron Pipe & Foundry Co., Burlington, N. J., has announced a wage reduction of 20 per cent at its local plant. The Thomas Devlin Mfg. Co., manufacturer of malleable iron castings and hardware specialties, same location, has issued a notice to the effect that there will be no change in wage schedule at the present time.

The Boston & Albany Railroad Co. car shops at Allston and West Springfield, Mass., which closed Dec. 27, reopened Jan. 3, with 80 per cent of the forces taken back.

Ferroalloys and Steel-making Metals in 1920

Collapse of the Automobile Industry a Serious Factor — Ferrovanadium a Strong Feature — World Market Aspects and Metallurgical Developments

BY ROBERT J. ANDERSON

THE post-war inflation of the past two years has been reflected sharply in the ferroalloy and metallurgical ore industries, and the unsettled conditions that prevailed in 1919 have continued in general through 1920. Taken by and large, however, now that a good part of the liquidation in ferroalloys has been completed, the industry is in a much better condition today than it was a year ago. At the same time, with an industrial depression at hand, no marked improvement can be expected in the near future. Labor troubles and the railroad strike evidently affected the production and consumption of ferroalloys about equally. It was expected that the British coal strike would upset the manganese markets, but this was of such short duration and domestic requirements were so well filled at the time that its effect was practically nil.

The collapse in the automotive industry was felt sharply by ferroalloy makers and by manufacturers of special alloy structural and high-speed steels. While the automotive trade takes only about 10 per cent of the total steel production of the country, its collapse was especially serious to ferroalloy makers because the motor industry is a very heavy consumer of special alloy structural steels, as well as high-speed tool steels for machining purposes. As in 1919, ferrovanadium was very strong in the past year. The scarcity of ferromanganese and the use of substitute alloys for ferromanganese were other noteworthy features.

World Markets and the Trade Situation

Statistics as to the production and consumption of ferroalloys, with the exception of ferromanganese and related alloys and certain grades of ferrosilicon, are still almost impossible to get. Owing to the inability of British ferromanganese makers to deliver on contract, because of the manganese ore shortage in England, prices for both the ore and alloy were subject to wide fluctuations, and spot ferromanganese sold at almost war prices. The 40 per cent freight increase that went into effect on Aug. 26, 1920, was reflected in increased prices for some ferroalloys and a shifting of buyers' inquiries for supplies. The transportation situation, which was so serious in the spring last year, caused the shutting down of a number of steel plants and the curtailment of steel production at others, with a consequent decline in ferroalloy consumption.

The export demand for some American ferroalloys was brisk, but exporters were not anxious to do business because of the political and financial conditions abroad. On the other hand, foreign offerings of ferrotungsten and ferrochromium were made at prices much below those of domestic makers. The French ferroalloy industries pooled their interests and arranged to secure American trade lost during the war. None of the pending tariff bills on ores and alloys has yet become a law, but it is expected, with the revision of the tariff this winter, that a number of these will be passed. The War Minerals Relief Commission continued to act on claims for losses, and this matter will soon be definitely closed. A rather melancholy interest attaches to the business situation in chromium, tungsten and molybdenum, and the markets for the ores and alloys of these metals have continued to be exceptionally lifeless.

Metallurgical Developments

Some few outstanding metallurgical developments that have been in the formative stage for some years have reached industrial importance in the past year or two. A comprehensive idea of the metallurgical developments in the ferroalloy industry in recent years may be gained from the papers presented at the ferroalloy symposium of the American Electrochemical Society in Boston, last April, by Gibson, Bardwell, Saklatwalla, Raven and the writer. One of the most important developments of 1920 was the introduction of the Söderberg self-baking electrode into the United States from Norway by J. W. Richards. The great possibilities of this electrode have been recognized, and it is now in use on electric ferromanganese furnaces of the Southern Manganese Corporation, Anniston, Ala. The carbon reduction of vanadium is a development of great importance. The re-entrance of the electric furnace into the ferro-manganese field, after a shutdown of all plants for more than a year, is worthy of special note. Attention may be directed to the paper by Keeney before the National Electric Light Association at Pasadena last May, in which a good summary of the recent metallurgical and technical developments is given.

Further attention has been paid to the possibility of using oxygen-enriched air in the blast-furnace production of some ferroalloys. It is certainly true that where blast furnaces are operated with high top temperatures, as those on ferromanganese and ferrosilicon, a definite gain in operating efficiency would result from the use of an oxygen-enriched blast. Another interesting development in the use of electric ferroalloy furnaces has been their application to the manufacture of potash and phosphoric acid on a fairly large scale.

Ferromanganese and Related Alloys

In metallurgical manganese ore, domestic production was stimulated by scarcity of foreign ores, by the heavy demand for ferromanganese and by relatively high prices. Domestic production of manganese ore in 1920 was about 125,000 gross tons* as against 55,085 tons in 1919 and 305,869 tons in 1918. Imports were about 500,000 tons in 1920 as against 333,341 tons in 1919 and 491,303 tons in 1918. A number of the domestic mines that were shut down in 1919 were operated in 1920, and considerable activity prevailed in the Arkansas and Montana fields. The situation that has existed in the Caucasus since 1916, owing to the crazy political events in regions dominated by Soviet Russia, is a great pity, but no immediate improvement is discernible. The position of England as to supplies of manganese ore was critical, especially in the second quarter, and English makers attempted to exchange foodstuffs with the Russians for Caucasian ore. Domestic ore sold at $.050-0.75 per unit, f.o.b. mines, for 45 per cent minimum; Brazilian ore brought $0.42-0.80 per unit, c.i.f. Atlantic port, and Indian ore was offered at $0.75.

The situation in ferromanganese was characterized

*Figures for 1920 are estimates in all cases, since they are based on figures for only part of the year.

by high prices for spot alloy, by considerable scarcity at times, and by the re-entrance of the electric furnace makers into the field. Production of both ferromanganese and spiegeleisen was at a better rate in 1920 than in 1919, but still considerably below the prewar rate.

The domestic output of ferromanganese in 1920 may be taken as about 280,000 gross tons as against 179,029 tons in 1919 and 345,306 tons in 1918. The spiegeleisen production in 1920 was about 116,000 tons as against 65,391 tons in 1919 and 249,002 tons in 1918. Imports of ferromanganese were about 54,000 tons in 1920 as against 33,022 tons in 1919 and 27,168 tons in 1918. Exports of ferromanganese were about 2000 tons in 1920, compared with 2999 tons in 1919 and 3577 tons in 1918. When British makers were in the market their prices for ferromanganese were about the same as those of domestic makers; 78-82 per cent alloy opened at $130 per ton, and up to $225 was quoted in July. Prices declined in the closing months. Both Japan and Italy offered small lots of ferromanganese in the American markets at price concessions. The failure of British makers to deliver on contract caused some domestic consumers to run decidedly short. While in 1919 it seemed impossible that domestic makers could maintain themselves against British competition, it appears that now this can be done. Our fuel costs will be lower than theirs, and the vital factor of ore supply will be the future determinant.

Despite labor and transportation difficulties the domestic output of ferromanganese increased month by month, and the scarcity that threatened the steel industry in the early part of the year had vanished by September. In England, on the other hand, the situation was desperate at times, and some steel makers there had to resort to the use of silicomanganese and calcium silicide. Five electric furnace ferromanganese plants operated in the United States last year. Prices for spiegeleisen increased from $38 to $40 per ton for the 18 to 22 per cent alloy in January to $75 to $85 in August, where they held to the close. Export inquiry for spiegeleisen was active all year. Silicomanganese, containing 15 to 20 per cent Si. and 45 to 55 per cent Mn. was produced for the trade by an Eastern maker at $200 to $225 per ton. The use of an oxygen-enriched blast in the production of blast furnace ferromanganese is suggested in a patent (U. S. 1,354,490) by the late J. E. Johnson, Jr.

Ferrosilicon and Related Alloys

The situation in ferrosilicon in 1920 was much improved over that which prevailed in 1919, although there was an overproduction of the 50 per cent electric furnace alloy. Owing to the shut-down of the Jackson and New Straitsville stacks in Ohio, because of scarcity of coke, there was a shortage of Bessemer ferrosilicons, and high prices were obtained for these alloys. This shortage, however, was quickly made up by the appearance of large quantities of the 12 to 15 per cent electric furnace alloy at prices lower than Bessemer ferrosilicons. Foreign competition for the American market continued strong in 1920, but the demand was better than in 1919 as old stocks in steel makers' hands had been cleared away. Imports of all grades of ferrosilicon in the year were about 16,000 gross tons as against 10,445 tons in 1919 and 5540 tons in 1918.

Prices ranged as follows: Bessemer ferrosilicons, 9, 10, 11, and 12 per cent grades, sold at $56.50, $59.50, $62.50, and $66.10 per ton, f.o.b. New Straitsville, Ohio, and nearby points until July; a series of advances then occurred to $66, $69.50, $72.80, and $76.10, respectively. Domestic 12 to 15 per cent electric furnace alloy sold at $65, furnace, or $68, delivered Pittsburgh. The 50 per cent grade was considerably overproduced. Prices were held steady, however, at $80 to $90 per ton, delivered. The 75 per cent alloy sold at a range of $150 to $200.

In the metallurgy of ferrosilicon, no important developments have occurred during the past year. The production of pig iron from a mixture of scrap steel and ferrosilicon in the cupola was found economical by some foundries in the past year because of the scarcity of pig iron. Walter (English patent 143,553, May 19, 1920) suggests that the hardness and brittleness of iron-silicon alloys, containing about 15 per cent silicon, can be reduced by the addition of 0.01 to 0.04 per cent boron.

Ferrochromium

The depression in mining chrome ore in the United States during 1919 continued through 1920, although the strengthening of the ore market in the past year enabled some of the California mines to operate. The general domestic condition, however, was decidedly poor and the output was small. California concentrates, 50 per cent grade, sold at 70 to 75 cents per unit, f.o.b. mines; the 35 to 40 per cent grade was held at 50 to 60 cents. Foreign ores sold at 70 cents to $1.25, seaboard, according to the grade and the source. Freight rates from California to eastern consuming points are such that foreign ore is cheaper than domestic. A duty of 50 cents per unit of Cr_2O_3 is suggested by the pending McNary bill.

Prices for the various grades of domestic ferrochromium were held fairly steady in 1920, despite the offerings of foreign alloys at low prices. The consumption and demand were less than in 1919. Ferrochromium, 6 to 8 per cent C grade, sold at 19 to 22 cents per lb. of contained Cr. throughout most of the year, while the 4 to 6 per cent C grade commanded 1 to 2 cents per lb. more. Cancellation of alloy steel orders and the continued light demand for high-speed steel were reflected in dull markets for ferrochromium and ferrotungsten.

The increasing demand for stainless steel in the United States and England is of more than passing interest. As will be recalled, this steel, which contains about 14 per cent chromium, had gained prominence in the British cutlery trade before the war, but its importance as an engineering material of construction has been recognized only in the past three or four years. Its anticorrosive properties, its flame resistance and its unusual tensile strength at high temperatures suggest its effective use for many purposes. Since American steel makers are required to pay a royalty for the right to make stainless steel, efforts are being made to develop a similar steel with other alloying elements. The method of making fixed additions of chromium to steel by the use of alkaline-earth salts of chromium has been suggested (English patent 131,896, Aug. 27, 1919).

Ferrotungsten

The tungsten industry all over the world was practically at a standstill in 1920. The mining of ores was at a low ebb, and the production of metallic tungsten and ferrotungsten was small. There is little prospect of the revival of domestic mining unless the Timberlake bill is passed. The ore markets were very weak, with price declines continuing throughout the year. Imports of tungsten ores were about 1600 tons in 1920 as against 8400 tons in 1919 and 10,362 tons in 1918. Domestic scheelite sold at $9 to $15 per unit of WO_3, f.o.b. mines, for 60 per cent concentrates in the opening months of the year, but the price steadily declined to $6. Wolframite opened at $7.50 to $10 but declined to $4.50 to $5. Chinese wolframite was available at concessions throughout the year, and Bolivian ore was offered freely at prices below the domestic market in an attempt to move accumulated stocks. Production ceased

in New South Wales, but shipment to Liverpool of concentrates from the unique scheelite placer at Neigetsu, Korea, continued.

Prices of ferrotungsten and metallic tungsten were lower in 1920 than in 1919, owing to the decline in demand and to foreign dumping. The 70 to 80 per cent alloy was quoted at $1.25 to $1.40 during the first two months of the year, but it closed very weak at 75 to 90 cents for the domestic product. British ferrotungsten was offered as low as 50 cents per lb. of contained tungsten. The commercial exploitation of metallic tungsten in the form of small pressed tablets (known as tabs) has been attended with gratifying results, the volatilization losses on addition to steel being much less than when the loose powder is used. The building of the proposed ferrotungsten plant at Hankow, China, has been indefinitely postponed. The possibility of tungsten losing ground in the manufacture of tool steel through the substitution of molybdenum has been suggested. This is exceedingly remote, as will be explained under ferro-molybdenum below.

Ferrovanadium

Ferrovanadium was very scarce in 1919, and high prices ruled, especially on resale alloy. The demand, both domestic and foreign, was exceptionally heavy. The world's ore supply has been increased substantially by the discovery of additional large deposits at the Peruvian properties of the Vanadium Corporation of America. It is now estimated that ore can be supplied indefinitely at the present rate of consumption. Numerous improvements have been completed or are in prospect at the Peruvian properties, and these will have an important effect on supplies. Domestic vanadium ores sold at $1 to $3 per lb. of contained V_2O_5 in 1920, depending upon the grade. The American Vanadium & Lead Mines, Ltd., has been organized to take over the working of the Doornhoek vanadium and lead properties in the Zeerust district, South Africa. Since the last review was written, the properties of the Primos Chemical Co. have been acquired by the Vanadium Corporation of America, and the vanadium deposits in San Miguel County, Colorado, are being extensively worked.

The ferrovanadium situation abroad—especially in England—was acute, owing to the heavy decline in exports from the United States. Ferrovanadium sold at $5.50 to $8.50 per lb. of contained vanadium, according to the percentage of silicon; small resale lots brought up to $14.

In the metallurgy of ferrovanadium, it is of more than passing interest to direct attention to the fact that the bulk of the future output of this alloy will be produced in the electric furnace using carbon as the reducing agent. This will mean greatly decreased production costs. The employment of vanadium in structural and in automobile steels has lost some ground. In the next few years it is likely that there will be considerable application of vanadium-containing alloys, such as cuprovanadium and aluminovanadium in the metallurgy of the non-ferrous alloys.

Ferromolybdenum

The year 1920 was a quiet one in ferromolybdenum. This was due to the slowness with which molybdenum structural steels are being taken up and not to any actual shortcomings of these steels. Foreign offerings of molybdenite were made at 60 cents to $1 per lb. of contained MoS_2, but the market was largely nominal and dealings were few. Statements which have been made in the past to the effect that there is no assurance of ore supply are totally without foundation. The fact is that the domestic production of ore can be expanded at a moment's notice to meet all discernible demands. Ferromolybdenum sold at $3 to $3.50 per lb. of contained Mo, in the early months of the year, but the price soon declined to $2 to $2.50. Undoubtedly it will take some time before the use of molydenum steel becomes at all general, and substantial improvement in the demand for molybdenite and ferromolybdenum is not to be expected.

The writer is not prepared to endorse the opinion that molybdenum steels will largely replace nickel structural steels or that molybdenum high-speed steels will become important soon. Considerable furore was raised over Dr. Anorld's so-called super high-speed steel containing molybdenum. The evidence available does not indicate that any startling discovery has been made, and there is no need for excitement or alarm over this steel. There have been indications that the English newspaper reports were inspired propaganda for molybdenum.

Calcium molybdate has been shown to be satisfactory for introducing molybdenum into steel, by the work of Kissock, McKinney and others. Cohade, the French metallurgist, has stated in the past year that molybdenum causes flakes in steel, but there has been much dissent from the view that molybdenum *per se* is a flake producer.

Ferrotitanium, Ferrouranium and Ferrozirconium

It is reported that certain noteworthy developments have been made in the case of complex titanium-bearing steels for armor plate and ordnance, but detailed data are not available. If titanium should prove to be a valuable alloying element for use in steel, there will be no possibility of shortage, since the known deposits of titanium minerals are sufficient to supply any discernible demand for a long time to come. The prices for ilmenite and rutile were practically stationary last year; the former brought 1¼ to 2 cents per lb. for 52 per cent TiO_2, while rutile sold at 10 to 25 cents per lb. for 95 per cent material. Ferro-carbon titanium sold at $200 to $250 per ton, and alumino-thermic ferrotitanium was higher.

Up to the present time, the use of uranium in steel metallurgy is not very fully developed or understood. Uranium is used to a small extent in certain ternary and quaternary tool steels. Uranium oxide sold at $2.75 to $3 per lb. for 96 per cent material, and carnotite ore, minimum 2 per cent U_3O_8, commanded $2.75 to $3 per lb. of contained U_3O_8. Ferrouranium, 35 to 50 per cent U, sold at $7 per lb. of contained U.

A 20 per cent ferrozirconium has been used in England to some extent instead of ferrotitanium. The effect of ferrozirconium upon cast iron has recently been investigated by Moldenke, who states that it is useful here as a deoxidizer and that an addition of 0.10 per cent causes increased strength and deflection. Some complex alloys high in zirconium for use as cutting tools have been developed by Cooper (U. S. Patent 1,350,359). The foreign deposits of zirconium oxide are large enough to supply the entire demand, and this makes the value of any domestic deposit of zircon (zirconium silicate) very doubtful, since the reduction difficulties with this silicate are much greater than with the oxide.

Minor and Complex Ferroalloys

Nothing of striking importance has developed in the minor and complex ferroalloys and in the minor steel-making metals in recent years. Alloy metallurgy is making such immense strides, however, that it is not well to ignore the more rare metals. Ferroaluminum is receiving some attention again, but little is heard of ferroboron and boronic steels. Further experimental work on the use of cerium in steel metallurgy is in progress. Ferrocerium sells for $12 to $15 per lb. Leon Cammen has experimented with the use of fluocerite ($E_2O_3.4F_3$, where E is the metal) which contains about 80 per cent Ce, about 1 to 4 per cent Y, and remainder F. This mineral, which occurs in Sweden, breaks up under

the action of heat liberating cerium and fluorine. It would appear to be worthy of further investigation for making additions of cerium to steel.

Metallic cobalt is still used to some extent, particularly in some good grades of high-speed tool steels, and considerable cobalt now goes into the manufacture of stellite and related alloys. A new complex deoxidizer, viz., a uranium-magnesium-aluminum alloy, has been employed commercially for deoxidizing chromium structural steel. The smelting of ferrophosphorus from glauconite in the blast furnace is patented by Meadows (U. S. 1,322,038). A number of complex ferroalloys containing titanium have been patented recently by Sicard.

The Year in Iron and Steel Metallurgy

But Little Development Because Attention Was Paid to Troubles of Labor and Transportation—Self-Baking Continuous Electrode

BY LEWIS B. LINDEMUTH*

THE year, 1920, has contributed very little to the metallurgy of iron and steel. The year has witnessed a demand for steel products far in excess of the possible producing capacity of the country and a change from prosperity to depression, which came about more rapidly than at any previous time in the history of the industry.

During the period of demand, labor conditions prohibited full realization of the benefits of conditions by rapidly decreased efficiency and continual demands for higher wages, interspersed with agitation, strikes and disturbances. During this period, also, freight rates were substantially increased and fuel became scarce, so that there was a continually increasing cost of production. The independent producer, relying on the market for his raw materials, was confronted almost weekly by a change in the economics of his operations, the principal factors being the increased differential in the price of pig iron and steel scrap and constantly increasing conversion costs. It was therefore necessary that a decreased mixture cost, increased conversion cost and decreased tonnage be so arranged as to give the minimum cost of ingot product consistent with quality. Steel works, generally, have therefore had little time or opportunity to develop anything new in the way of design or operation, or to carry out the necessary experiments required by any real improvement.

Blast Furnace and Open Hearth

The experience with blast furnaces in the past year has demonstrated that the tendency toward increased bosh angles and wider hearths gives increased tonnage and lower fuel ratio. It is possible that the near future may see the bosh angle increased to its maximum of 90 deg.

The principal development in the design of open hearth furnaces was made at the Steel Co. of Canada by Frank McCune, general superintendent. The furnace in question uses coke oven gas for fuel, with both gas and incoming air introduced under pressure. A marked economy in fuel has been obtained with this furnace over the commonly existing types of coke oven gas furnaces. The gas employed contained the benzol and light oils so that plants equipped for benzol recovery might not realize the same degree of economy. It is proposed to apply the principles of this furnace to producer gas-fired furnaces.

Another improvement in the burning of coke oven gas in producer gas-fired furnaces has been the introduction of coke oven gas into the gas uptakes instead of through burners as has heretofore been the custom.

The coal shortage during the year has brought about several changes in furnace construction permitting the use of either producer gas or oil with a furnace delay of less than six hours in changing from one fuel to the other.

The metallurgy of the open-hearth process has in many plants been improved. The improvement, however, consisting in the use of a higher percentage of manganese in the mixture, represents perhaps a realization rather than a recent development.

Electric Furnace

When the automobile industry lowered its production, the demand for the products of the electric furnace and for tool steels decreased materially. The electric furnace has fulfilled its expectations by practically eliminating the crucible process as a factor in our steel production. A new development in electric furnaces which has met with success in the ferroalloy industry and which has possibilities of being extended to the electric steel furnace is the Söderberg self-baking continuous electrode. This electrode consists of a steel tube filled with prepared carbonaceous material which bakes itself in the furnace in which it is used. Extensions are made to the tube, by welding in place, and it is filled with the carbonaceous mixture and lowered into the furnace as the bottom portion burns away. A great economy in electrode cost has been obtained with this type in ferrosilicon furnaces in Norway and it is now being demonstrated in this country.

The 35-ton Heroult furnaces installed at the Naval Ordnance plant at South Charleston, W. Va., will be placed in operation early in January, 1921. These units represent the largest and most modern installation yet attempted.

In the metallurgy of cast iron, the electric furnace is beginning to play an important part. It is used in the production of thin-walled and intricate castings as an adjunct to the cupola for desulphurizing and for the manufacture of malleable iron. The ease of superheating in the electric furnace, its rapid and complete desulphurization and the control of the product make it an ideal unit in foundries which work to exacting specifications and which produce difficult shapes.

The proposed use of electric furnaces in conjunction with the basic Bessemer process in Lorraine and Belgium has not materialized.

Heat Treatment

Considerable progress has been recorded in the development of facilities for accurate heat treating, principally in the more extended use of electrically heated furnaces. There has also been introduced from France the Chantraine furnace, which is a gas or oil-fired furnace, the flame being admitted to the heating chamber through a large number of small jets over the entire area of the furnace.

The Sandberg process for heat treating the heads of rails with air or steam, while introduced several

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years ago, is now in operation in several plants in Europe and at one large plant in the United States. Recent tests of rails so treated have shown an increased life in track, and handling facilities have been so improved that a large tonnage of rails may be taken care of without interrupting the operation of a modern rail mill.

General

Considerable time has been expended in the development of special steels for various purposes. The most prominent among these has been the development of several grades of steel for resistance to corrosion by water or acids, or oxidation by heat, in both rolled products and castings. The application of the principle of centrifugal casting has been experimented with in both iron and steel products.

Other developments have been discussed and contemplated, but extremely trying operating conditions, high costs and the recent depression in business have hindered the development and the overcoming of problems which under more favorable conditions would undoubtedly have resulted in advances and economies.

British Iron and Steel in 1920

Prices Twice as High as Obtained After War of 1870—Collapsing at End of Year but Held in Check to Make Sliding Scale Contracts Good

LONDON, ENGLAND, Dec. 13.—A review of the British trade in iron and steel during the year just ended includes the completion and the beginning of the end of the greatest boom which has ever been known. The prices of iron and steel have reached a level which is twice as high as that which was attained in the previous great boom which followed the war of 1870. Very few people are left in the trade who can remember that boom; but the writer is one of them. The slump that followed eventually brought prices lower than they had ever been in the history of the trade—until No. 3 pig iron was sold at less than 30s. per ton, and new steel rails at 75s. per ton. The collapse of the last boom is now with us; but there are not many—if any—who believe that it will be so complete as the collapse which followed the previous boom. At the beginning of the present year some of the pricipal prices current in iron and steel are as given in the accompanying table:

Prices per Ton

	At Beginning of Year			At Crest	
	£	s	d	£	s
Cleveland pig iron	8	0	0	11	5
Scotch pig iron	9	15	0	13	10
Hematite pig iron	10	0	0	13	0
Basic pig iron	8	5	0	11	15
Steel ship plates	22	0	0	30	0
Steel bars	18	15	0	26	0
Common billets	16	7	6	21	0
Bar iron	23	0	0	30	0

At the time these prices were looked upon as extreme figures, and many people in the trade considered them to be dangerously high; but during the year the costs of ores, fuel and wages continued to rise, and in view of the fact that there was practically no competition from the Continent of Europe, or from America, prices continued to advance to the fullest extent of the rise in costs and beyond it.

The high-water mark of iron and steel prices was reached in the early autumn of the year, although at that time both Belgium and Germany were showing signs of increasing competition, not only in Great Britain itself, but in the colonial and foreign markets, which were supposed to be the preserves of British trade. The prices current at this crest of the boom are also given in the table.

It may be mentioned that the price for hematite is for the East Coast make; West Coast and Scotch hematite were from 25s. to 55s. per ton dearer; and it must also be mentioned that the prices were for domestic consumption and that as a general rule higher prices were exacted for export shipment. Most of these prices were in force up to the time of the coal strike, when business generally was brought to a standstill.

Efforts to Prevent Runaway Prices

The peculiar feature in the Cleveland iron trade this year has been the steady effort of the makers to prevent the price from running away. This effort has been partially successful, and as a result the price of Cleveland No. 3 foundry iron and of basic iron has, throughout the year, been held at some £2 to £2 10s. per ton below the prices at which other similar qualities of foundry and basic iron have been sold. As we have before said, the year opened with Cleveland iron at 160s. per ton, and this price had been steadily held since May, 1919, while the prices for other foundry irons, such as those made in the Midland districts, had been steadily advancing. On Jan. 6 the price of Cleveland was fixed at 175s. per ton, and again this new price was held against general advances in other districts until March 16, 1920, when it was raised to 200s. The next rise in Cleveland was on May 12 to 217s. 6d., and the final rise on Aug. 24 to 225s. In each of these cases the makers were practically compelled to make the advance.

The reader will of course understand that there has never been nearly enough Cleveland iron to go round and hence it is that the lower prices charged for it were not able to prevent extravagant prices in other districts. Very much higher prices were charged in the few cases where Cleveland iron was sold for shipment abroad; but as a matter of fact these sales were very infrequent and for long periods at a stretch there was no export trade. The comparison of No. 3 pig iron prices at the top of the boom is perhaps interesting and is as follows:

Various Pig Iron Prices per Ton at Top of Boom

	£	s
Cleveland	11	5
Scotch	13	10
Derbyshire	14	0
Staffordshire	14	10
Lincolnshire	14	5
Northamptonshire	13	0

One Reason for Scarcity of Foundry Iron

These prices compare with normal pre-war values of £2 10s. to £3 10s. per ton, so that the reader can see what the war and its after effects have done for pig iron prices in Great Britain. Before leaving the subject of foundry iron prices it may be worth while to explain that the main reason why such tremendous figures have been possible is that the make of foundry iron in Great Britain was greatly reduced by the call for steel-making irons, particularly for basic pig iron. This fact suggests that as the Continental and American supply of finished steel grows and the demand for British steel declines—and this process has already begun—the make of foundry iron will begin again to increase and will eventually become normal.

The very extravagant prices current here throughout the year for foundry iron have led to some importations from Belgium, which we believe are the first which have ever come from that country. America has not yet taken much advantage of these prices, but she is certainly in a better positon to do so, because many years ago there was a large trade here in American imported foundry iron, and many of our leading iron founders know the qualities quite well and are acquainted with the best methods of using them. Hence it may be expected that during the slow process of get-

ting foundry iron down to reasonable figures in Great Britain an opportunity may occur to carry on an import business in American makes of foundry pig, more especially if the normal exchange rates between the United States and Great Britain can be re-established.

Finished Iron and Steel

The upward movement in the markets for finished material progressed steadily from the opening of the year until the occurrence of the coal strike in October. The accompanying comparative list of some of these prices taken in January and in October, 1920, will afford some idea of what has taken place.

Comparative Prices per Gross Ton of Finished Steel

	Jan. 1	Oct. 1
	£ s	£ s
Bar iron	23 0	30 0
Iron bolts and nuts	45 0	57 10
Steel strips	22 0	28 0
Steel bars (5 to 8 in.)	19 10	26 10
Steel sheet bars (semi-steel)	16 0	21 0
Steel hoops	26 15	38 15

It will be obvious to everyone acquainted with the trade that some of these October prices were quite unnecessarily high, and if one may be allowed to say so, they represented a very undesirable form of what it is fashionable to call "profiteering." For instance, there could have been no necessity to charge £8 15s. per ton more for hoop iron than for bar iron, or £27 10s. per ton for the mere cost of manufacturing iron bolts and nuts from bar iron or rod iron; hence it is obvious that these extravagant prices might be brought down very considerably, irrespective of any fall in the costs of production.

Opportunities for Imports from United States

There were opportunities here for the development of a large import trade from America, but they do not seem to have been utilized to any extent. Actual business in most of these materials was held up in October during the brief stoppage of coal production, and it is rather curious to note that when the industries of the country resumed activity at the end of October there was no resumption of the former eagerness to buy. In ordinary times this could have led to an immediate slump in the prices; and some of the more extravagant prices began to fall after October, steel bars and ship plates being reduced by £2 per ton, and iron hoops by £5 per ton; but the more general readjustment of prices has still to come and may be postponed till the end of the year.

The reason for this will not be at once appreciated by anyone outside the manufacturing trade, but it is to be found in an objectionable practice which has grown up during the war. This practice has resulted in a large number of contracts being made on a "sliding scale" of prices, it being an agreement that any increase of costs should be added to the contract price and, on the other hand, that any official reduction of prices made before delivery should be credited to the buyer. The interest of the manufacturer thus lay in postponing any official reduction until all the contracts were completed.

It is expected that this process of completion will be over at the end of the year, and then we may see some drastic alterations, possibly big enough to lead to a temporary panic. The tampering with the just principles of buying and selling must eventually bring about punishment, and the sooner the trade receives it the better for all concerned. It is of course not possible in this review to give the prices at the final markets of the year, but at the time of writing the makers' prices may perhaps be represented by the figures in the accompanying table:

Prices per Ton on Dec. 15, 1920

	£ s	£ s
Cleveland foundry iron		11 5
Scotch foundry iron		13 10
Derbyshire foundry iron		13 15
Forge pig iron	11 5 to	12
Basic pig iron, Cleveland		11 15
Basic pig iron, other makes	13 5 to	13 10

British Imports

It will be seen that Scotch and Cleveland pig irons have not been reduced from the highest point touched, but that all the other pig irons have begun to come down. This process is perhaps slightly assisted by the arrivals of Continental foundry iron, mainly from Belgium, but it is caused principally by the refusal of foundrymen to pay the higher prices.

The coming disorganization of the market for finished iron and steel is perhaps best indicated by a comparative list of the prices of both British and Continental material at the close of the year, as follows:

British and Continental Prices Compared

	British at works, per ton	Foreign at ports, per ton
	£	£ s
Steel billets, rolling quality	17	11 15
Steel bars up to 6 in.	26	17 0
Bar iron	30	20 0

These are enormous differences when we remember that before the war a difference of 1s. or 2s. per ton was enough to divert the consumer from the use of British to the use of foreign material; but of course the actual quantity of this cheap iron and steel coming into our markets is not yet very great. With regard to this matter, which is of considerable importance, we cannot of course give the figures for the whole year, but figures for the first ten months are available and these will show sufficiently what has been taking place. Take first the question of semi-finished steel supplies. The receipts of foreign billets were as follows:

British Receipts of Billets in 10 Months

	1913	1919	1920
From Germany, tons	243,458	none	11,047
From Belgium, tons	89,240	514	
From United States, tons	64,945	30,335	200,394
From all other countries, tons	22,324	12,226	

It will be seen that during 1919 Germany was able to do nothing and Belgium was not in a much better plight, but France had begun to work and the comparatively high prices attracted something from the United States. In 1920 further progress was made in the business of importing foreign billets, the total imports for the ten months being 211,441 tons, against a total of 43,075 tons in 1919. Germany, however, had only just begun to send billets to Great Britain up to October and the bulk of the imports have come from the United States and from "other countries" including France, viz., 200,394 tons out of 211,441 tons. During next year, however, we may confidently expect to see a very much larger importation of German and Belgian billets (of course in the absence of any "anti-dumping" legislation), but it remains to be seen whether the American import trade will grow very much. The import trade in pig iron is represented by the following figures, up to the end of October:

Imports of Pig Iron for Ten Months

	1919	1920
From America, forge and foundry, tons	5,824	6,915
From other countries, forge and foundry, tons	1,435	5,491
From America, basic, tons	77,706	6,499
From other countries, basic, tons	21,008	116,392

These figures are curious. When we consider the immense advance in the prices paid here for foundry pig iron during 1920 they are a little puzzling. One would be inclined to say that the United States were neglecting their opportunities in this branch of the trade.

High Local Prices Encourage Imports

In the finished iron trade the import business has been growing steadily during 1920 as a result of the extravagant prices exacted by British manufacturers. Belgium has sold six times as much as in 1919, the actual figures being 33,903 tons this year, against 5547 tons last year. Imports from Belgium, however, are still not quite half as large as they were in 1913. The wire rod imports are practically the same this year as last year, but beams are now beginning to come in from Belgium.

Considering the position of the import trade as a whole one would be inclined to say that there was ample opportunity for a vast development in the American section, notwithstanding the impossible state of the trade, but the United States must recognize that selling always involved a corresponding amount of buying; and that if she is not prepared to take goods for goods, business cannot expand as it ought to do.

British and Continental Blast Furnaces

An American Engineer's Observations on the Departures from Approved Practice in This Country—Outputs Need to Be Increased and Labor Cost Reduced

AT the request of THE IRON AGE, Arthur G. McKee, president Arthur G. McKee & Co., Cleveland, has set down the following interesting observations regarding present conditions in the iron industry in Great Britain and other European countries which he visited a few months ago:

"The manufacture of iron in Great Britain originally developed under very favorable conditions, as fuel and ore of excellent quality were easily available and in close proximity to each other. As the years went on, the labor employed in the plants became skillful and intimately familiar with the work in all of its special details, and this labor was available at low cost. While the richest of the ores are being largely exhausted, large quantities of leaner ores are still available at low cost, and many of these are almost or quite self fluxing. The very rich ores of Norway, Sweden, Spain, Portugal and North Africa are available, with water and rail hauls averaging about the same distances as in America.

"Contrasted with these conditions it is interesting to consider the fact that the iron industry in America, except in the Southern States, has always been confronted with the obstacles due to transporting ore and fuel long distances in order to bring them together. Contrary to the usual impression, these ores when figured in combinations with the necessary flux or limestone, actually contain only about 40 per cent of iron, and on account of their being usually found in the form of fine particles or dust, tremendous difficulties were encountered before it was learned how to smelt them successfully. At the same time the labor has always been well paid, unskilled, and to a large extent unable to speak the English language.

"As the natural result of the two sets of conditions mentioned above, the English industry continued to use the relatively cheap and skilled labor which was available, without extensive investment in labor saving equipment, while the American industry was compelled to develop facilities for cheap transportation and for the manufacture of iron with a minimum of man power, and these facilities were necessarily of the most fool-proof sort, so that they could be successfully operated by the labor available.

British Handicaps Increasing

"Both of these developments were logical and reasonably satisfactory while the conditions persisted, but now that the labor in the United Kingdom must be paid at much higher rates and the raw materials are much more expensive on account of their partial exhaustion and the greater amount of labor required for their mining and assembly, the conditions are quite different. It is very generally conceded by the thinking men in the industry that if Great Britain is to continue to be a large factor in the iron and steel business of the world, much must be done in the way of improving the facilities for transporting raw materials, and not only making the blast furnaces produce much larger tonnages per day, but also that the labor per ton of pig iron be materially reduced.

"It is, of course, absolutely essential that the plant owners and the labor unions co-operate heartily in this or it will be practically impossible to accomplish a result satisfactory to either. On the other hand, if the owners of the plants spend the necessary large amounts of money to improve the plant equipment and if the men operate that equipment efficiently, the result will undoubtedly be a satisfactory increase in income to both.

"Without attempting to analyze the causes, it appears to be a fact that in some trades the policy of certain British labor unions is to restrict the production per man in order to prevent over-production and to stimulate continuous employment. Serious and honest consideration will reveal the weakness of such a policy, since, if the production per capita of the necessities and comforts of life is less, there will be in like measure less of those necessities and comforts available for the enjoyment of all. It is useless to attempt to modify the fundamental law that the returns to those engaged in industry, whether as capitalists or workers, will ultimately be proportioned to production and the country which produces the least per man must always be the country of the greatest poverty, with the least provision for the comfort and luxury of the mass of the people.

"This is illustrated by reference to the vast population of the Orient where the production per man is very low. Labor produces in normal times just enough to provide for the bare necessities of life, with no surplus production to draw upon, and a crop failure or other abnormal occurrence results in a condition of actual want for a large proportion of the population.

"Very fortunately, the iron and steel industry of Great Britain many years ago adopted the system of compensating its workers on the basis of tonnage produced. This step has resulted in stimulating an increase in production and in promoting a generally cordial relation between employer and employee. A change in this condition is unlikely and would be most unfortunate for everybody.

"Therefore it seems safe to predict that if present conditions in Great Britain continue, with a small output per furnace, incomplete provision of labor saving appliances and the contingent small production per man employed, the future of the iron business will be less attractive. On the other hand, the iron and steel industry of Great Britain has a long history of magnificent achievements to its credit. The excellent reputation of its products has been established in the markets of the world for many years past and the personnel of trained workers and executives together with a well organized and efficient merchant marine for the distribution of these products is of inestimable value. With these advantages, combined with more modernized plants and skilled labor, aided by more efficient equipment, there is no doubt of a future far greater and more prosperous than ever before.

Continental Blast Furnace Practice

"On the Continent many blast furnace plants have been provided with modern equipment but it

is of a much more complicated and therefore more costly nature than is necessary.

"The general practice of carrying the top structure of the furnace on columns and banding the brickwork requires far more steel per furnace and this construction offers no advantage to justify its greater expense. The bucket type hoist is almost universally used for mechanical filling and rather elaborate equipment is installed to avoid breakage of the coke. In a large number of cases the coke buckets are filled at the coke ovens and transferred to the furnace top without rehandling. They are then discharged directly into the furnace without the use of a large bell. On the other hand no very effective system of stock distribution is in use.

"In view of the American practice of using smaller coke carefully screened, means for accurately distributing the materials in the furnace, and the light, simple and effective bins and skip hoists it would seem advantageous for the iron masters of the Continent to investigate carefully the methods and equipment used in this country before proceeding with any extensive program of rebuilding the wrecked plants in the war zone.

"The general use of much smaller sized materials in the furnace charge—i.e., coke, limestone and ore—and with the coke and limestone carefully screened and freed from impurities would, in the light of our experience, result in larger tonnages, lower costs and more generally satisfactory operation.

"The common use of gas engines both throughout Great Britain and on the Continent as well as a number of other refinements in the power departments of the various representative blast furnace plants are well worthy of the careful consideration of American managers, especially in view of the increased cost of coal now prevailing."

A Year's Progress in German Iron and Steel

Holland the Chief Export Market—In Spite of Handicaps Germany Makes Headway — Fuel Economies and Other Technical Advances

(*Special Correspondence.*)

BERLIN, GERMANY, Dec. 7.—It is not possible to write a satisfactory review of the German iron trade for 1920, inasmuch as some of the most important data are lacking. No statistics of iron and steel production are published, nor does the Government give out any figures for exports. It has forbidden the publication of such figures for some reason. When the production statistics come to be published it probably will be found that the make of steel ran far ahead of pig iron, as there was much old material coming upon the market after the war, for which there was a great demand on the part of the open-hearth steel plants.

Prices Advance, Then Decline

The year began with a sharp upward movement of prices in progress, caused by the heavy depreciation of the German mark in the last four months of 1919. Prices continued to rise sharply until May, after which a marked reaction set in. The movement of the year may be illustrated by taking four articles, as in the following table, prices being in marks per metric ton:

	Foundry Iron, No. 1	Best Steel Scrap	Blooms	Bars
January	1324.50	1300	1465	1745
March	1625	2700	2225	2600
May	1790.50	1200	2900	3650
July	1740	600	2650	3200
October	1660	1025	2260	2840
November	1660	850	1895	2440
December	1660	875	1895	2440

The prices now prevailing will probably prove stable as to the home market, at least, up to the end of February. On the other hand, increasing competition in foreign markets, especially from France and Belgium, has made it necessary for German companies to accept export orders at lower prices than those mentioned above. Minimum prices, it is said, can no longer be maintained.

Holland the Main Export Market

Holland is the chief battleground of this war of competition. German concerns are exerting themselves specially to hold their position there, and apparently with success. A late Dutch report mentions that three-fourths of the imports of iron and steel into Holland are of German origin.

The Dutch statistics of imports from Germany during the first nine months of 1920, compared with the like period of 1919, are as follows: plates, 80,959 tons, against 72,401; bars, profiles and bands, 137,294 tons, against 70,644; girders and beams, 12,848 tons, against 7,246; steel rails and other track materials, 34,555 tons, against 32,633; piping, 30,812 tons, against 12,226; wire and barbed wire, 6,583 tons, against 2,547; commodities made of iron and steel, 22,872 tons, against 3,799.

This sharp competition for the Dutch market has created a demand there for protection by the owners of machine, boiler and motor shops. Wire and cable works and foundries are also supporting the demand. The machine shops are asking for an extra duty of 25 to 30 per cent.

Belgian Steelmakers Want Protection

There is also a movement for protection in Belgium aimed against Germany. While Belgian works are fighting against Germans for possession of the Dutch market, they complain that German competition in pig iron, semi-manufactured steel and all kinds of finished products in the Belgian market itself has assumed dimensions that had not been believed possible several months ago. This competition is understood in Belgium as resulting from the depreciation of German currency since August; hence the Belgian iron trade is demanding "exchange protection." Meanwhile the competing power of mills in Luxemburg has been enhanced through an arrangement by which they enjoy the advantage of the Belgian home prices for coke, or a reduction from 175 to 135 francs per ton.

Belgian complaints of German exports to that country can hardly be true as to pig iron. While German coast furnaces are exporting a little hematite, there is a marked scarcity of pig in the Ruhr district. The big mixed establishments are mostly offering none for sale; and the association has been under the necessity of importing supplies from Luxemburg, England, and, to a small extent, from the United States. In the Upper-Silesian district there is also a marked famine in pig; and the works will not be able to offer any for some months.

French Works Compete in Switzerland

Exports of iron and steel to Switzerland have been lighter of late, owing to the sharper competition of French works. Holland and its colonies have been buying actively in piping. Bars and plates are also in good demand for export. Scandinavian countries are rather good buyers. The Silesian district latterly has been getting good foreign orders, presumably from southeastern countries. Nevertheless, the prospects for large exports to the east and southeast are not re-

garded as promising under existing conditions. Unsettled political affairs and depreciated currencies are the two great obstacles, whereas there is a huge potential demand in all the countries referred to.

At the opening of the year there was a great rush of buyers. It seemed to be assumed that prices would continue to rise, and for that reason there was much speculative buying. The disturbances connected with the "Kapp episode," however, together with the great improvement in the mark which began about that time, brought a decided turn in the market. Buyers began to hold off; but prices were again raised in May, after which the movement has been downward.

A new situation began for the German industry with the Spa agreement in July. The increased deliveries of coal imposed upon Germany by that agreement reacted unfavorably in two directions. In the first place, it sharply curtailed the supply of coal and coke available for iron and steel production, so that some of the most important establishments have less than half of their furnaces now in blast. In the second place, the increased coal and coke supply in France made that country a much more active competitor in foreign markets. That occurred also with the Saar mills, which at once found themselves with ample fuel supplies through the relaxation of the demand from France.

A Year of Large Steel Earnings

Notwithstanding many adverse conditions the past business year was one of great prosperity for German iron companies. Profits earned and dividends distributed exceeded all previous records—as measured in the present depreciated currency. Most of the companies, too, set aside large sums for renewals and betterments; and very many of them have raised or are still raising new capital in considerable amounts. Despite the fact that most of the big mixed concerns are running to only 50 to 65 per cent of their capacity, and some considerably less, there is much new building going on. A new steel works has just begun operations at Düsseldorf. Thyssen and the Mannstaedt concern (the latter now controlled by Peter Klöckner) are erecting blast furnaces; Phoenix and others are carrying out extensive improvements. In the Silesian district some open-hearth plants are under construction.

Of course, all such work now costs enormously more than before the war; and that is why large new capital is called for. It now costs 60 to 80 million marks to erect a blast furnace, as against 2 or 3 millions before the war; to sink a double coal shaft costs 300 to 600 million marks, as against 20 millions. Nevertheless, at least four of the big western companies are now sinking new shafts.

Fuel Economies Imperative

The shortage of fuel has already been referred to. That has been the most serious obstacle to iron production this year. The number of miners has considerably increased, indeed, but the product per man—except in the case of old skilled cutters—is considerably below normal. The expense of building new shafts has just been mentioned. The lack of house room for new miners is also a serious obstacle, an apartment for an average miner's family now costing 90,000 to 100,000 marks, as compared with 4,000 marks before the war. Many applicants for work in mines—they even include ex-officers in the army—must now be turned away for lack of housing facilities.

Owing to what the report of the Verein Deutscher Eisenhüttenleute call the "well-nigh catastrophic distress into which the German iron industry has been brought by the Versailles Treaty and the Spa agreement," much attention is being given to methods for economizing fuel. The Verein itself has organized at Düsseldorf a "Waermestelle," or fuel economy section, which employs 200 specialists to work in conjunction with the engineers of the various companies in evolving methods to save fuel. It began work only at the middle of 1919; and already, says the Verein's report, its work has resulted in saving thousands of tons of coal; while still better achievements are expected. Many of the works, too, have combined to establish a "coal-technical company," which is to work out problems of fuel economy. One method that has been adopted for economizing coke in iron smelting is to mix the charge for getting a maximum of pig with a minimum of coke by using rich foreign ores and much scrap. It is reported that one-third to one-quarter of the material now put into the charge is scrap.

The substitution of brown coal, or lignite, for bituminous coal has made extensive progress with iron works; and not a few of the big companies have been acquiring brown coal properties. Such concerns are reconstructing furnace hearths with a view to increasing the draft, which must be stronger with brown coal than with bituminous.

Consolidations the Feature of the Year

The most important development of the year in the iron and coal industries was the organization of a number of big trusts. The movement for the combination of companies in one form or another assumed far larger dimensions than ever before. The details have been given from time to time in this correspondence; and it is not necessary to repeat them here. Suffice it to say that the movement has not yet run its course; the absorption of companies by the big conglomerate concerns is still proceeding and is expected to continue.

It has been supposed that the chief motive behind the movement is the determination of iron and coal men to find means to defeat the Government's plans to "socialize" the coal industry; and it cannot be doubted that the numerous annexations of coal mines by iron companies will greatly complicate that problem, if not defeat it altogether. Yet the consolidation movement began from a quite natural impetus. Several very important companies had built exceedingly efficient plants in Lorraine or Luxemburg during a decade before the outbreak of the war; and these were expropriated under the terms of the Versailles treaty, with the result that the companies in question were left with clipped wings, so to speak. But they came into much ready money from the liquidation of their properties. Thus it was only natural that they began to buy up other iron works or coal mines as the case demanded, in order to round out their production schedules again. This has proceeded in part along the lines of what is called "vertical annexation." In other words it is sought to bring into a single combination ore and coal mines, blast furnaces and steel plants, rolling mills down to the most finished forms, as well as important consumers of such goods, like electrical and other machine shops. And all this rests upon the deduction that the German iron industry—after the loss of its great minette ore fields and the rolling mills in Lorraine and Luxemburg—would be compelled to convert as much of its products as possible into the most highly finished forms, thus making its labor and skill tell most effectively in goods when exported.

The Use of Minette Ores

That loss of ore fields has not entirely excluded Germany from the use of minettes, indeed, and since the Spa agreement these ores have been arriving regularly in the Ruhr district. But the conviction prevalent with furnacemen is that under existing conditions it is better to smelt Swedish and Spanish ores, along with Germany's own supplies; hence 50 to 75 per cent of the ores now consumed are foreign. Of home-produced ores the tendency is to select only the higher grades, while the poorer ones become a drug on the market. Production in the Siegerland—the principal German field—is lagging somewhat behind that of 1919. It is reported that Rhein-Elbe, Phoenix, and Hoesch recently have acquired control of a big ore deposit in the province of Minas Geraes, Brazil; and German concerns are arranging for manganese supplies from the Black Sea.

Technical Research in Iron and Steel

The spirit of scientific investigation is still very much alive in the German iron industry. An institute of iron research—which curiously is named after the ex-Kaiser—was recently opened at Düsseldorf under charge of Prof. Wuest, who was hitherto connected

with the Aachen Technological University. He will have a corps of assistants, who will co-operate with the technical experts of the various companies. An institute of metal research is also just being organized here, with head office at Neu-Babelsberg, near Potsdam. It is presided over by Prof. Heyn, formerly of the Charlottenburg "Tech." One of his assistants is Dr. Kessner, who won the Carnegie medal a year or two before the war for a drill test for determining the hardness of metals. Kessner has just patented a simplified drill which he thinks will wholly displace the spiral drill, as it can be made at half the cost of the latter. He uses a bar of electric steel, a cross-section of which is a rather inchoate double T.

Electric steel has otherwise come into much more extensive use than before the war, and many new furnaces have been put into operation. Church bells are now made of that material, with fully as good results as with bronze. Another improvement, which came into use during the war, is the employment of alloys of lead in place of tin with calcium, magnesium or barium, in making bearings for axles and journals. The national railroads are just now making successful experiments with such bearings.

The Schiess Maschinen-Fabrik of Düsseldorf has introduced an improved machine for drilling holes in ship and boiler plates. It is operated by one man; he can shift the position of the drill or the plate at will; and he can do twice or thrice the amount of work formerly done by two to three men.

ILLEGAL CONSPIRACY

Supreme Court Hands Down Important Decision in Regard to Secondary Boycott

A decision of great importance affecting the relations of employers and employees was rendered Jan. 3 at Washington by the Supreme Court of the United States, involving the provisions of the Clayton law by which unions sought to make themselves free from prosecution and judicial injunction in carrying on what is commonly known as the secondary boycott. The decision is considered as ranking in importance with that of the Supreme Court which held the Danbury Hatters' Union guilty of unfair practices. The contention of organized labor that the Clayton law exempted it from the operation of those sections of the Sherman act which had been held to apply in the Danbury hatters' case, is overturned.

Six justices of the court, including Chief Justice White, voted to uphold the opinion rendered. Justices Holmes, Brandeis and Clarke dissented.

Overrules Two Lower Courts

The decision overrules the United States District Court for the Southern District of New York (Manhattan) and the United States Circuit Court of Appeals, which had held that the Clayton act rendered labor unions immune from prosecution for employing the secondary boycott.

The case arose through an action of the Duplex Printing Press Co. of Battle Creek, Mich., in the United States District Court for the Southern District of New York, against the International Association of Machinists which has its headquarters in New York. The company, which manufactures printing presses, asked for an injunction against Emil J. Deering and William Bramley, business agents of District 15 of the International Association. Michael T. Nayland, business agent of Local Lodge 328 of the same organization, was also made a defendant. The District Council and the lodge named are unincorporated associations having headquarters in New York.

The company asked that these defendants and their organizations be restrained from interfering with the company's conduct of its business. The District Court dismissed the complaint and the Circuit Court of Appeals upheld that decision. The Duplex company then appealed to the United States Supreme Court.

Held to Be Illegal Conspiracy

In substance the Supreme Court held that the action of the International Association in calling a strike because the Duplex company refused to recognize the closed shop, and in refusing to permit the setting up of Duplex presses throughout the country, was a conspiracy in restraint of interstate commerce in violation of the anti-trust laws. It was contended by the Duplex company that the acts of the International Association of Machinists were similar to those of the Danbury hatters held to be illegal by the Federal Supreme Court.

The dissenting opinion of Justices Holmes, Brandeis and Clarke, delivered by Justice Brandeis, makes the contention that the court's decision renders futile an effort of more than 20 years to place employers and employees on an equal basis before the law. These three justices held that the action of the International Association was not a secondary boycott but, "an instance of a strike of those who have a common interest to protect themselves by preventing use of products which part of them have tried to prevent manufacture of by a strike." The point was made that it was clearly a case of self-defense.

This contention was supported by citing that manufacturers refused to sell their products to customers employing union labor exclusively. The question is, said Justice Brandeis in the dissenting opinion, whether 60,000 laborers may not say that they would not let their men work on products manufactured in shops against which the laborers were striking.

In the opinion of the Court, delivered by Justice Pitney, it was held that the actions of the Association of Machinists constituted a secondary boycott and were not a part of the normal and legitimate aims of a trade union and were therefore unjustified under the Clayton act.

While a prayer for damages was presented by the Duplex company, it was not pressed, the court said, "and calls for no further mention."

Walter Gordon Merritt, 135 Broadway, of counsel for the Duplex Printing Press Co., states that the Supreme Court's decision is "as important a decision as has been handed down by the United States Supreme Court in many years." He added that "the political and economic consequences of the decision will necessarily be far-reaching."

The decision, said Mr. Merritt, was to be considered in its bearing on other cases pending in which the activities of labor unions in controversies with their employers are involved.

"The contention of the labor unions has been that they might use their economic power by strikes, boycotts and similar means, so long as they did not commit a breach of the peace," said Mr. Merritt. "This decision holds that the economic power of labor organizations may not be used in such a way as to violate the law."

Meeting of Automotive Engineers

The sixteenth annual meeting of the Society of Automotive Engineers will be held in New York Jan. 11 to 13, in the Engineering Societies Building, 29 West Thirty-ninth Street. There will be three simultaneous technical sessions Wednesday afternoon, Jan. 12, covering chassis design for fuel economy, body engineering and commercial aviation.

Thursday morning, Jan. 13, Dr. C. F. Kettering will disclose the results of extensive fuel research work carried on under his direction. The fuel session will be continued in the afternoon simultaneously with a highway session.

CONTENTS

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On the Road to Prosperity

The most hopeful thing in the business situation to-day is that the people of the United States are again on the road to prosperity. It is more than six years since they traveled in that direction. When they were piling up profits on business that came to them from the frantic effort of the Allies against Germany, they cut loose from the long-established principles of economic production. Later when our own country entered the war and the Government borrowed billions from the people and wastefully spent them, as it had to do, with little regard to anything except to build ships and to make guns and shells enough to crush the enemy, the net result was the destruction of accumulated wealth.

Then followed a period of peace, but the spending of wealth rather than its production was still a controlling purpose. And now a start has been made on the return journey which it is hoped will bring the people back to some old-time ways—of thrift, of pride in work and of live and let live—which the war made unfamiliar.

There is encouragement in the general recognition that war prices, war profits and war wages are an unhealthy combination that ought not to last. Their most dangerous effect was the creation of an appetite which could only be satisfied by more of the same vicious diet. It was beginning to be believed that the war had so changed everything that the old and not easy way of working and saving had been abolished. We are on the way to a wholesome correction of that belief.

How far high prices involve blame that can be placed has been a good deal discussed; but there is little profit in such discussion now. The responsibility, apart from what can be laid to the war, is so well distributed that one part of the community has little warrant for accusing another. What is more to the point now is that employers, employees, producers, consumers, bankers, borrowers, manufacturers, jobbers, retailers, see not only their separate and individual interest, but the obligation to lessen the hardships the readjustment may bring to those with whom they deal.

One of the evil legacies of the war was the simultaneous presentation of all manner of demands—for profits and wages, for political, industrial and social rights and privileges—by various groups of the community, by various peoples and countries, large and small. It has been a time for crowding to the front individual and group interests, with little regard for the common interest. One of the gains to be expected from the discipline of the readjustment that is now in process and that will continue through 1921 is a better appreciation of the need of pulling together. It has been demonstrated over and over that there can be no prosperity for one fraction of the nation or for one section of the country at the expense of another, and the sooner all the people learn that lesson again the sooner will the ground be covered that separates them from real prosperity.

Duration of Readjustment

The question is commonly asked, how much more time will the business readjustment require that is now under way in the United States? Theoretically there are two viewpoints—one, that the readjustment will last until prices and wages are down to "bottom"; the other that it will last until buyers have grown tired of waiting and accordingly decide to "take hold."

Neither of these views has a very solid foundation either in precedent or in the way men's minds operate. As to finding "bottom," it is to be said that in an industrial depression prices, wages and costs will decline as long as the depression lasts, whether three months or three years. Meanwhile, there is buying all along the way, of the sort that represents upkeep at its lowest terms, and at prices which mean unsatisfactory profits, reduced wages and the absence of incentive toward new enterprise.

The declines that have been discussed for some time as necessary to bring buyers into the market are such as will make prices appear fair and reasonable, particularly such as will bring prices for various commodities into proper or more nearly normal relation after having been wrested from their usual equivalency by the abnormalities of the war.

Declines in intermediate materials are not sufficient to start the ball rolling. The manufacturer who maintains prices on his finished goods and sees his raw materials at much lower prices will not buy

the raw materials simply on that account. His price to the ultimate consumer must be made right before business is set in motion. In this connection it is to be noted that prices of various manufactures of steel are not yet in harmony with the lower prices the steel mills are naming for the rolled products that are raw material for such manufactures.

As to the view that the readjustment will be ended by buyers getting tired of waiting, and therefore taking hold, that is not human nature. In trade gossip of late there has been frequent reference to manufacturers having made large profits, whereby they can "afford" to keep their plants idle awaiting a return of profits they had set their minds upon. The normally constituted manufacturer would soon tire of a wait for the return of an inordinate profit. There are manufacturers to-day who are willing to accept contracts that would show a loss based on present costs, because they believe that during the process of filling the contracts they can get their costs down so as to show no loss on the contract as a whole, but instead a condition at the end of the period that would enable them to take other contracts at the same price and make real profits on them.

Underlying much of the present hesitation is the belief that while in a number of raw materials the reductions have been drastic, few products of the factory have fully discounted lower manufacturing costs. Reductions in labor cost thus far have been but small fractions of the advances made in the war period. There is even a possibility that some raw materials will rise as the factories accumulate what is necessary to resume operations, even though the tendency of labor costs continue downward.

Everywhere the tendency is to judge prices by their relation to the basis of 1913-14. That there will be no return to pre-war standards in 1921 or 1922, and possibly not in many years, is a common opinion, based on the war's addition of more than a billion dollars to our gold supply and on the credit expansion produced by the Federal Reserve Act. But if the figures deduced from a study of the price indexes representing cost of living rightly place the settling point for food, clothing and other commodities of the retail store at one-third to one-half above the level of 1913-14, there is still considerable readjusting ahead for wages. Further, since all industries are subject to the same influences, and variations from general tendencies cannot long exist in any, further price revisions have been predicted for steel, fuel, paper, lumber and some other important lines. These will require a good deal of time. So far as the steel trade is concerned, it has never entered upon a year of transition and uncertainty in sounder financial condition than it enjoys to-day. Its ability to meet the unusual demands of the present situation is a stabilizing factor that should be helpful to every other industry.

The movement of scrap iron and steel to foreign melting furnaces is one of the features of a remarkable year in American exports. All previous records, both of peace and war, were broken last year. To Dec. 1, 1920, these exports were 206,395 gross tons, or 17,200 tons per month, against a pre-war record of 8119 tons per month in 1913 and 12,131 tons per month in 1917, the largest war exports. Such an export movement would not have been predicted a year ago in view of the supposedly large supplies from the battlefields. A possible explanation is the lack of pig iron in Europe, where the 1920 output has been much below either war or pre-war records.

American Steel and World Supply

The efforts of France, Belgium and Germany to produce steel in the past two years have had a good deal of attention from the rest of the world. So much had been written about the destruction of French and Belgian plants by Germany and of the crippling of Germany as a steel producer through the loss of Alsace-Lorraine that the working out of the problems of steel makers in all three countries was bound to be watched closely.

A setting down of the figures for iron and steel production in the five leading countries confirms what has been said in THE IRON AGE'S correspondence from Great Britain and Continental countries that the two years since the armistice have given the steel makers of Germany, France and Belgium but little hold in the markets of the world. Statistics of steel output in 1920 in the United States, Great Britain and the three Continental countries emphasize the commanding share of the United States. For the United States and Great Britain the data given below are complete to December, while those for France and Belgium are based on ten months' returns. In Germany no iron and steel statistics have been published since November, 1919. The figures given are the average for the first ten months of that year. They have been repeated for 1920. As our correspondence elsewhere indicates, the German industry was handicapped throughout the past year and it is a question if the output of 1919 was equaled. The figures represent monthly average production, gross tons being used for the United States and Great Britain and metric tons for the other three countries. Comparison is made with 1919 and with 1913:

Estimated Monthly Output of Pig Iron and Steel in Five Countries in 1920, 1919 and 1913

Pig Iron:	1920	1919	1913
United States	3,000,000	2,584,600	2,581,000
Great Britain	645,000	617,000	855,000
Germany	519,000	519,000	1,508,000
France	246,000	289,000	428,000
Belgium	80,800	.....	204,000
Total	4,490,800	4,009,600	5,576,000
Steel Ingots and Castings:			
United States	3,420,000	2,889,270	2,608,000
Great Britain	738,000	658,000	639,000
Germany	632,000	632,000	1,633,000
France	242,600	190,000	385,000
Belgium	97,260	.....	202,300
Total	5,129,860	4,369,270	5,467,300

In 1913 the United States contributed 46.3 per cent of the pig iron output of the five countries; in 1919 its proportion rose to 64.4 per cent and advanced to 66.8 per cent in 1920. In the other countries pig iron output has declined since 1913, even Great Britain showing a net loss of about 200,000 tons per month last year, not all accounted for by the coal strike. The falling off in the pig iron output of the four European countries by about 1,100,000 tons per month last year and

by 1,500,000 tons per month less in 1919 than in 1913 is an outstanding feature.

In steel the relations are somewhat different, but the United States is even more strongly predominant. Its percentage of the total in 1913 was 47.6, rising to 66.1 per cent in 1919 and to 66.6 per cent in 1920. Last year the United States produced more steel than in any year previous to the war. Great Britain also greatly increased its production despite the coal strike.

From producing less than half the pig iron and steel output of the five countries in 1913, the United States last year contributed two-thirds of the total in both pig iron and steel. For some time to come, therefore, this country is to be a dominant factor in the world's supply.

Another interesting deduction is that while the aggregate steel output of these countries last year fell only about 340,000 tons per month short of the 1913 figures, the pig iron decline was 1,100,000 tons per month, indicating a much larger use of scrap, from necessity or otherwise. There has been, in fact, a tendency in this country to use less and less pig iron in steel making.

Improved Labor Outlook

The labor situation at the beginning of the new year is much more favorable than had been expected.

The most important development in years in regard to laws affecting labor is Monday's decision of the Supreme Court of the United States, declaring that the un-American secondary boycott is not legal and that the Clayton act does not permit the carrying on of such a boycott. This decision cannot fail to check labor unions in pursuing such oppressive methods as were adopted in the strike of the Duplex Printing Press Co., out of which grew the case just decided, and in many other strikes throughout the country.

Another encouraging sign is the announcement that the officials of the Pennsylvania System have reached a working agreement with engine and train service employees whereby it is hoped that strikes will be prevented. The Pennsylvania management states that the Joint Reviewing Committee of the Pennsylvania System, formed for the settlement of all controversial questions affecting engine and train service men, will be composed, on behalf of the management, of two representatives from each of the four regions of the system, and, on behalf of the employees, of the general chairmen of the men in the engine and train services. The votes of all members of the committee, whether representatives of the management or of the employees, will be of equal power, and not less than a two-thirds vote will be necessary to reach a decision upon any question presented.

Probably in the practical operation of this system there will be some problems. Possibly some method not disclosed by the statement has been provided to prevent deadlocks. However this may be, it is gratifying to find that representatives of employers and employees have been able to come to an agreement which to them seems satisfactory, and that the union plan of nationalization has not been received with favor.

As Vice-President Atterbury of the Pennsylvania Railroad recently pointed out, the effort of the union to force national agreements and to have national boards of adjustment organized is nothing more than a demand for a country-wide closed shop, and is a long step toward the nationalization of the railroads. The agreement just adopted presents a substitute for the plan proposed by the unions, and if it should be adopted by other railroads will do much to insure industrial peace. The arguments in favor of the different railroads controlling their own affairs with their own employees and against the nationalization or one big union plan are overwhelming.

Historic Low Prices

There is an impression in some quarters that the market price of heavy rolled steel products has declined repeatedly to about a cent a pound, as if it were a natural thing for such a price to appear at recurrent intervals. A correspondent in Wisconsin writes that he has the impression that such declines have occurred at intervals for 30 years past, despite advancing wages.

It is not true that declines to the neighborhood of a cent a pound have been frequent. Such declines rather have been exceptional, and they have all fallen within a really narrow space in the history of the iron industry. The merchant bar, the largest tonnage item, one of the oldest of rolled products and in all time the cheapest, with the possible exception of grooved skelp, is naturally taken for comparison. Hammered bar iron, for which the late Mr. Swank secured price statistics from 1794 to 1844, was succeeded by rolled bar iron, for which the statistics begin with 1844, the rolled material being half a cent higher than the hammered material in that year. In the fore part of the eighteen-nineties the dominance of steel over iron for rolled products generally was established, although in the seventies steel had supplanted iron for rails.

In 1794 hammered bar iron averaged 3.46 cents per pound. As low a price did not occur again until 1843, so that the cautious buyer, awaiting the return of former prices, would have had to be very patient. In 1851 there was a low point, for rolled bar iron, of 2.44 cents as the year's average. The industrial depression that began in 1873 was three years old before that low point was struck again, but in 1878, the last calendar year of the depression, the average was 1.93 cents. The prices just cited are all at Philadelphia.

Switching to the Pittsburgh market, the depression that began late in 1883 brought a new low price, 1.55 cents in August, 1885. That remained the record low until the industrial depression beginning in 1893, when steel supplanted iron.

Thus in the history of iron bars there was one interval of 49 years before a low point once struck was touched again, while there was another case in which 25 years was required. The lowest price for the steel bar was 0.90 cent per pound, in June,

July and August, 1897, and June, 1898. The boom of 1899 carried the price up to 2.60 cents. The subsequent decline carried the price down to 1.05 cents in August, 1900, so that the market failed by $3 a ton to reach its former low point. The next low point was in 1904, but it was 1.30 cents, or $5 a ton higher still. In November, 1911, a price of 1.05 cents was common, and the experience was repeated in December, 1914.

To sum up, the lowest price of iron bars prior to the industrial depression of 1893-8 was 1.55 cents, and that fell eight years before the depression, while in the history of the steel bar the conspicuous low points, with the years within which they fell, were as follows in cents per pound:

1897	0.90	1909	1.15
1898	0.90	1911	1.05
1900	1.05	1914	1.05
1904	1.30		

Thus all the prices in the neighborhood of a cent per pound fell inside a period of 20 years. Prices result from a combination of circumstances. Three important influences in determining steel prices in the past quarter century have had divergent trends. There was the progressive improvement in processes, tending to cheapen selling prices. There was the sudden appearance of the Mesabi range, furnishing very rich ores to be had for the trouble of scooping them up. The cheapest Mesabi ore was in 1898. Year by year the ores available have been leaner and harder to get at, something that engineering and metallurgical progress could not entirely balance. Finally, there has been the continued upward trend in prices in general, beginning with 1896 and well illustrated by Bradstreet's index number. These trends are too strong for economies in manufacture to balance.

Wages of Puddlers Slightly Reduced

Owing to the fact that the bi-monthly examination of sales sheets to determine the January-February tonnage rate for puddlers and finishers covered shipments during the period from Oct. 20 to Dec. 20, the result does not reflect the decline in the bar iron market. The average price of bar iron was found to be 3.50c. per lb., as compared with 3.55c. at the previous settlement, reducing the tonnage rate from $18.76, which prevailed during November and December, to $18.52 for the first two months of 1921. Finishers sustained a reduction of 2½ per cent. A bar iron maker states the November movement was at a high rate and a peak market, thereby helping to maintain the high average for the period. Though prices have meantime slumped, the boiling rate will continue near the peak because of the average price disclosed by the wage adjustment.

Iron Age Catalogue of American Exports

The second volume of the first edition of the Iron Age Catalog of American Exports has been issued and both books by the time of this writing are well in the hands of potential buyers in the four corners of the globe. The two volumes total 1950 pages and give in five master languages an encyclopedia of technical and trade facts concerning the products of American manufacturers. As a medium for fostering exports, the publication represents a monumental effort. The illustrations and descriptions are calculated to convey the information needed by the buyer and the use of his language makes the books a ready market tool. The catalog has been published by the Iron Age Publishing Co., and the department in charge says: "In 1921 500 American manufacturers will be better equipped to extend their world trade and 10,000 world-wide buyers will be better equipped to buy American goods."

Steel Corporation Coal Properties

The United States Steel Corporation, Pittsburgh, is planning to open up coal properties in the vicinity of Waynesburg, Pa., and will install a number of complete mining plants, with machinery for the most part electrically operated. The installation will include an electric power plant. The coal lands have been held by the Corporation for some time, and the project does not include the acquisition of additional property, as currently reported. Judge Gary states that the new operations are in harmony with the belief of the Corporation in the future of this country.

Production Records Broken

The Illinois Steel Co. recently secured record outputs from its structural, blooming and rail mills at South Chicago, according to the December issue of the *South Works Review*, an employees' publication. The new records and the previous records together with dates when made are given for the structural and blooming mills below:

		Previous Record		New Record	
Mill	Turn	Tons	Date	Tons	Date
No. 1 blooming mill	Hourly	187	3-24-20	208	10-25-20
No. 1 blooming mill	12 hr.	1,759	4-16-17	1,888	10-18-20
No. 1 blooming mill	24 hr.	2,880	4-16-17	2,906	10-18-20
No. 2 blooming mill	12 hr.	845	3-21-17	904	12- 3-20
No. 1 structural mill	12 hr.	1,589	4-16-17	1,625	10-18-20
No. 1 structural mill	24 hr.	2,462	4-16-17	2,486	10-18-20
No. 2 structural mill	Hourly	100	6-17-20	107	12- 3-20
No. 2 structural mill	12 hr.	693	10- 6-20	716	11- 2-20
No. 2 structural mill	24 hr.	1,186	4-12-20	1,250	11- 2-20
No. 2 structural mill	Month	21,951	1-19-19	22,910	11-19-20

In the No. 2 rail mill the following new hourly records were made in November: Section 1630 rail, 868 rails, 37 tons; section 1230 rail, 984 rails, 32 tons; section 2530 rail, 469 rails, 43 tons. On Nov. 1, 1920, the 12-hr. record on section 1630 was broken when 337 tons were rolled. This is equivalent to a single track 13½ miles long. The former record made Oct. 26, 1920, was 304 tons. On Nov. 3, the 12-hr. record on 2530 section was broken when 410 tons was rolled as against a previous record of 369 tons. A 24-hr. record was also secured on Nov. 3, when 768 tons of section 2530 rails was rolled.

Wage Reduction by Bethlehem Steel Co.

The Bethlehem Steel Co. has announced a reduction of wages at the South Bethlehem plant of from 10 to 20 per cent, effective Jan. 16. The announcement was made following a joint meeting of the company officials and representatives of the workmen under the employee representation plan in effect at the plant. The reduction is similar to the one being made at the Lebanon plant. A 10 to 20 per cent reduction is also announced for the Sparrows Point plant effective on the same date. The company employs from 5000 to 6000 men under normal conditions. This force has been slightly reduced in the past few weeks. No notice of wage reductions at the Bethlehem Shipbuilding Corporation has been given.

Corporation Stock for Employees

Employees of the United States Steel Corporation have been notified that they may subscribe to the common stock of the Corporation this year at 81. This is an opportunity that is extended by the Corporation to its employees each year. In January, 1920, common stock was offered to them at $106 per share and 66,407 employees subscribed to a total of 167,407 shares.

Testing Society Meeting for 1921

The American Society for Testing Materials will hold its 1921 meeting at the New Monterey Hotel, Asbury Park, N. J., where the last annual meeting was held so successfully. The exact dates have not been announced, the opening and closing days being dependent on the volume of business to be considered, but the meeting will fall in the week of June 20.

LOWER PIG IRON OUTPUT

December Daily Rate 10,608 Tons Less Than in November and Year's Lowest

Net Loss of 51 Furnaces—The 1920 Output Over 36,414,000 Tons

The December output of the blast furnace industry further emphasizes the slowing down of the industry which started late in October. The net loss in furnaces was the largest of the three months, making the total net loss for the last quarter 118 furnaces. The output for December was the lowest for the year.

The production of coke and anthracite blast furnaces in December, a 31-day month, amounted to 2,703,855 gross tons, or an average of 87,222 tons per day as compared with 2,934,908 tons, or an average of 97,830 tons per day in November, a 30-day month, and with 3,292,597 tons, or an average of 106,212 tons per day in October, a 31-day month. The April output, the next lowest for the year, caused by the railroad strike, was 2,739,797 tons, or 91,327 tons per day. The December output therefore shows a decline of 10,608 tons per day from November and 4105 tons per day from the April rate. There was a net loss of 51 furnaces last month, the total in blast on Jan. 1 having been 201 as compared with 252 on Dec. 1. There were 56 furnaces blown out and five blown in, the latter all being credited to the Steel Corporation, which showed a net gain of three furnaces.

Daily Rate of Production

The daily rate of production of coke and anthracite pig iron by months, from December, 1919, is as follows:

Daily Rate of Pig Iron Production by Months—Gross Tons

	Steel Works	Merchant	Total
December	61,815	23,129	84,944
January, 1920	72,015	25,249	97,264
February	75,230	27,490	102,720
March	80,021	28,879	108,900
April	65,168	26,159	91,327
May	68,668	27,644	96,312
June	73,659	27,792	101,451
July	71,954	26,983	98,937
August	72,740	28,789	101,529
September	74,908	29,402	104,310
October	77,214	28,998	106,212
November	71,669	26,161	97,830
December	66,037	20,185	87,222

The figures for daily average production, beginning with January, 1914, are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1914—Gross Tons

	1914	1915	1916	1917	1918	1919	1920
Jan.	60,808	51,659	102,746	101,643	77,799	106,525	97,264
Feb.	67,453	59,813	106,456	94,473	82,835	105,006	102,720
Mar.	75,738	66,575	107,667	104,882	103,648	99,685	108,900
Apr.	75,655	70,550	107,592	111,165	109,607	82,607	91,327
May	67,506	73,015	108,422	110,238	111,175	68,002	96,312
June	63,916	79,361	107,053	109,002	110,793	70,495	101,451
July	63,150	82,691	104,017	107,820	110,354	78,340	98,931
Aug.	64,363	89,666	103,346	104,772	109,341	88,496	101,529
Sept.	62,753	95,085	106,745	104,465	113,942	82,932	104,310
Oct.	57,361	100,822	113,189	106,550	112,482	60,115	106,212
Nov.	50,611	101,244	110,394	106,859	111,802	79,745	97,830
Dec.	48,896	103,333	102,537	92,997	110,762	84,944	87,222

Production of Steel Companies

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies, as well as from merchant furnaces producing ferromanganese and spiegeleisen, show the following totals of steel making iron, month by month, together with ferromanganese and spiegeleisen. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons

	Total production			Spiegeleisen and ferromanganese		
	1918	1919	1920	1918	1919	1920
Jan.	1,756,208	2,430,022	2,232,455	30,695	32,787	23,957
Feb.	1,620,254	2,209,470	2,181,679	26,114	28,105	28,038
Mar.	2,349,419	2,277,507	2,480,668	39,122	26,644	35,275
Apr.	2,411,488	1,838,677	1,968,542	35,511	17,308	27,628
May	2,513,577	1,586,805	2,128,720	54,633	14,604	33,407
June	2,407,166	1,655,944	2,209,770	44,844	14,254	34,751
July	2,456,693	1,906,604	2,230,567	51,762	14,805	36,789
Aug.	2,509,357	2,108,566	2,254,943	54,009	17,419	36 985
Sept.	2,507,381	1,828,613	2,247,250	66,275	20,631	39,546
Oct.	2,594,277	1,295,690	2,393,644	70,379	20,238	34,786
Nov.	2,501,867	1,727,656	2,150,075	59,638	19,964	26,944
Dec.	2,524,794	1,916,249	2,047,167	49,435	15,718	28,023

Output by Districts

The accompanying table gives the production of all coke and anthracite furnaces for December, and the three months preceding:

Pig Iron Production by Districts, Gross Tons

	Dec. (31 days)	Nov. (30 days)	Oct. (31 days)	Sept. (30 days)
New York	183,169	213,895	239,953	233,534
New Jersey	6,207	9,418	8,431	9,153
Lehigh Valley	78,243	83,539	109,875	100,309
Schuylkill Valley	46,124	82,002	102,863	89,498
Lower Susquehanna and Lebanon Valleys	43,845	66,535	85,821	80,862
Pittsburgh district	571,378	587,073	651,746	651,348
Shenango Valley	107,933	111,211	121,513	121,830
Western Penna.	90,681	110,240	164,071	156,155
Maryland, Virginia and Kentucky	50,304	97,151	112,663	110,097
Wheeling district	136,967	136,589	138,797	126,610
Mahoning Valley	303,211	293,353	313,355	281,785
Central and Northern Ohio	283,446	290,224	301,182	285,842
Southern Ohio	39,986	53,057	64,995	70,042
Chicago district	471,455	484,841	520,253	472,762
Mich., Minn., Mo., Wis., Colo., and Wash.	128,351	135,956	141,015	117,011
Alabama	153,460	169,760	198,353	197,532
Tennessee	9,095	10,064	17,711	24,953
Total	2,703,855	2,934,908	3,292,597	3,129,323

Capacities in Blast Jan. 1

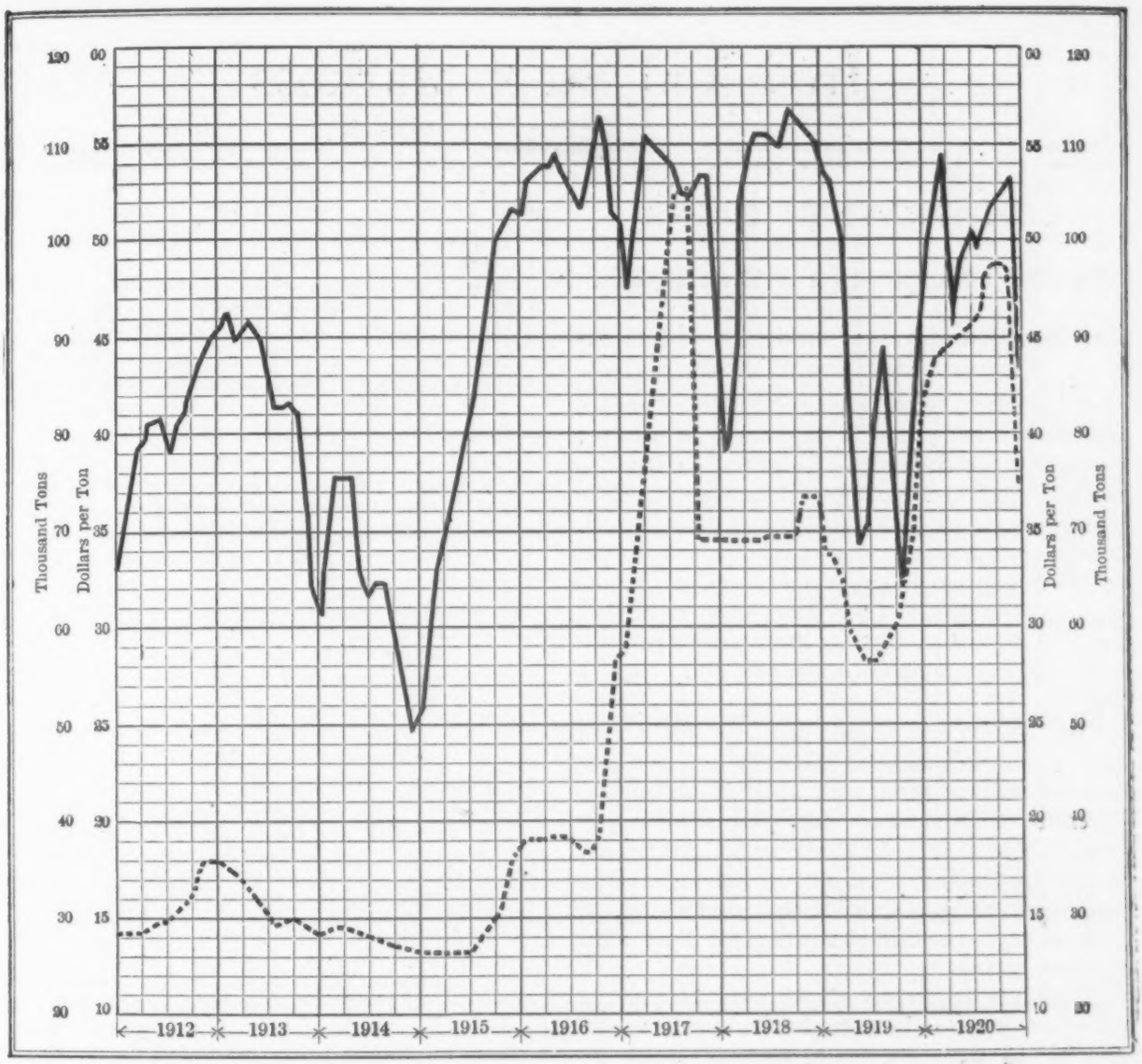
The following table shows the number of furnaces in blast Jan. 1 in the different districts and their capacity, also the number and daily capacity in gross tons of furnaces in blast Dec. 1:

Coke and Anthracite Furnaces in Blast

Location of Furnaces	Total Stacks	Jan. 1 — In Blast	Jan. 1 — Capacity Per Day	Dec. 1 — In Blast	Dec. 1 — Capacity Per Day
New York:					
Buffalo	22	12	4,400	14	4,940
Other New York	4	3	730	3	715
New Jersey	4	..	..	2	310
Pennsylvania:					
Lehigh Valley	18	5	1,340	10	1,800
Spiegel	2	1	90	1	90
Schuylkill Valley	14	4	960	8	2,510
Lower Susquehanna	8	1	450	3	1,300
Ferro	2	1	60	2	135
Lebanon Valley	7	1	175	2	300
Ferro	3	2	165	3	130
Pittsburgh District	56	37	16,800	39	17,700
Ferro and Spiegel	3	3	365	3	325
Shenango Valley	19	8	3,080	9	3,175
Western Penn.	25	9	2,900	15	4,200
Ferro and Spiegel	1	1	80	1	80
Maryland	6	1	400	2	800
Wheeling District	15	11	4,200	12	4,600
Ohio:					
Mahoning Valley	27	21	9,700	21	9,685
Central and North.	26	19	7,800	22	9,300
Southern	16	3	900	6	1,860
Illinois and Indiana	41	28	14,360	29	14,900
Mich., Wis. and Minn.	11	5	1,960	8	2,935
Col., Mo. and Wash.	6	5	1,260	5	1,510
The South:					
Virginia	17	3	355	8	935
Kentucky	7	..	..	2	305
Alabama	40	14	3,720	19	5,220
Tennessee	16	3	290	3	280
Total	416	201	76,540	252	90,040

The furnaces blown in include one Carrie furnace, one Edgar Thomson furnace and one Lucy furnace of the Carnegie Steel Co., in the Pittsburgh district; one Ohio furnace of the Carnegie Steel Co. in the Mahoning Valley and No. 4 Gary furnace in Indiana.

Among the furnaces blown out or banked are one Wickwire furnace and one Lackawanna furnace in the Buffalo district; the Musconetcong and the Oxford furnaces in New Jersey; one Bethlehem furnace of the Bethlehem Steel Co. the Macungie furnace of the Empire Steel & Iron Co., the second Lock Ridge furnace and the Saucon furnace of the Thomas Iron Co., and the Carbon furnace in the Lehigh Valley; the Delaware River furnace, the Topton furnace, one Warwick furnace and the last Worth furnace in the Schuylkill Valley; two Bethlehem furnaces at Steelton and two Bethlehem furnaces as well as the Vesta furnace in lower Susquehanna and Lebanon valleys; one Isabella furnace of the Carnegie Steel Co., one Eliza furnace of the Jones & Laughlin Steel Co., No. 3 Midland furnace of the Pittsburgh Crucible Steel Co., and one furnace of the Pittsburgh Steel Co., as well as the Clinton furnace in the



The Full Line Represents the Daily Production of Pig Iron and the Dotted Line Is the Average of the Price Per Ton of No. 2 Southern Pig Iron at Cincinnati, Local No. 2 Iron at Chicago and No. 2X Iron at Philadelphia

Pittsburgh district; one Shenango furnace in the Shenango Valley; three Johnstown furnaces of the Cambria Steel Co, as well as the Earlston, Rebecca and Scottdale furnaces in western Pennsylvania; the Alleghany and Buena Vista furnaces of the Alleghany Ore & Iron Co., the second Low Moor furnace, the Covington furnace and the Oriskany furnace in Virginia; one furnace of the Bethlehem Steel Co. at Sparrows Point, Md., and No. 1 Ashland furnace and the second Watts furnace in Kentucky; one La Belle furnace in the Wheeling district; one Hubbard furnace in the Mahoning Valley; the Dover furnace, No. 1 River furnace and one Toledo furnace in Central and Northern Ohio; the Belfont furnace, the Portsmouth furnace, the Ironton furnace of the Marting Iron & Steel Co. in southern Ohio; the Mark furnace and one Madeline furnace in the Chicago district; No. 1 Mayville furnace in Wisconsin; the second Detroit furnace in Michigan; the Zenith furnace in Minnesota (blown out Jan. 1); one Pioneer furnace of the Republic Iron & Steel Co., No. 1 City furnace and the Philadelphia furnace of the Sloss-Sheffield Steel & Iron Co., one Bessemer furnace of the Tennessee Coal, Iron & Railroad Co., and the Sheffield furnace in Alabama.

Diagram of Pig Iron Production and Prices

The fluctuations in pig iron production from 1910 to the present time are shown in the accompanying chart. The figures represented by the heavy line are those of daily average production by months of coke and anthracite iron. The dotted curve on the chart represents monthly average prices of Southern No. 2 foundry pig iron at Cincinnati, local No. 2 foundry iron at furnace at Chicago, and No. 2X at Philadelphia. They are based on the weekly quotations of THE IRON AGE.

Production of Coke and Anthracite Pig Iron in the United States by Months, Beginning Jan. 1, 1916—Gross Tons

	1916	1917	1918	1919	1920
Jan....	3,185,121	3,150,938	2,411,768	3,302,260	3,015,181
Feb....	3,087,212	2,645,247	2,319,299	2,940,168	2,978,879
Mar....	3,337,691	3,251,352	3,213,091	3,090,243	3,375,907
Apr....	3,227,768	3,334,960	3,288,211	2,478,218	2,739,797
May....	3,361,073	3,417,340	3,446,412	2,108,056	2,985,682
June....	3,211,588	3,270,055	3,323,791	2,114,863	3,043,540
July...	3,224,513	3,342,438	3,420,988	2,428,541	3,067,043
Aug....	3,203,713	3,247,947	3,389,585	2,743,388	3,147,402
Sept...	3,202,366	3,133,954	3,418,270	2,487,965	3,129,323
Oct....	3,508,849	3,303,038	3,486,941	1,863,558	3,292,597
Nov....	3,311,811	3,205,794	3,354,074	2,392,350	2,934,908
Dec....	3,178,651	2,882,918	3,433,617	2,633,268	2,703,855
Total, yr.*	39,039,356	38,185,981	38,506,047	30,582,878	36,414,114

*These totals do not include charcoal pig iron. The 1919 production of this iron was 327,097 tons.

The production of ferromanganese and spiegeleisen was 28,023 tons which is surprisingly large in view of the slump in pig iron output. Of this total 23,436 tons was ferromanganese and 4587 tons was spiegeleisen. The former is practically the same as the monthly average for the previous 11 months. In fact, in the last quarter the ferromanganese output suffered no decline in spite of the loss in pig iron.

The leading corporations of Ft. Wayne, Ind., have organized an Employers' Association and have declared for an open shop.

The Superior Steel Co., Pittsburgh, has made a reduction of 10 per cent in the wage of its employees.

Iron and Steel Markets

CORPORATION GAINS

December Output 10 Per Cent Greater

Fifty-one Furnaces Less on Jan. 1 and "Independent" Curtailment Grows

The contrast in operations at Steel Corporation and independent plants is emphasized in pig iron production for December. The Steel Corporation made 120,000 tons more iron last month than in November, an increase of 10 per cent, while the independent companies made 180,000 tons less than in the preceding month, a falling off of 20 per cent. The independent producers blew out 19 furnaces in December, whereas the Steel Corporation had three more furnaces at work on Jan. 1 than on Dec. 1.

The country's pig iron output fell off sharply last month, the total being 2,703,855 tons or 87,222 tons per day, compared with 2,934,908 tons in November, or 97,830 tons per day. Only 201 furnaces were in blast Jan. 1. In December 56 blew out and 5 blew in, making a net loss of 51. The active capacity at the opening of the new year was 76,540 tons per day, as against 90,040 tons per day for 252 furnaces on Dec. 1.

With the beginning of the year independent producers announce a reduction in standard steel pipe to the Industrial Board basis of March 21, 1919. A feature of this decline to the Steel Corporation's pipe prices is that the other manufacturers have considerable business in tubular products on their books, in contrast with some other lines in which suspensions or cancellations have been the rule.

Another reduction made in the past week was in bar iron. The new Chicago price at 2.68c. figures back to 2.30c., Pittsburgh, or $1 per ton below the market for steel bars. Eastern sellers of bar iron, from a nominal level of 3.50c., Pittsburgh, have dropped $11 per ton, or to 3c., Pittsburgh.

The fact that buying in this or that line has had a little start in the past week is brought out in some market reports. But none of it signifies more than that inventories were stripped to the last ton and a little new steel had to be bought.

Some independent rolling mills had more work than was expected, for this first week of the year, but no general improvement in running schedules is looked for in January. Rail mills are faring better than some others.

A car works subsidiary of the Southern Railway is inquiring for 5000 tons of shapes, 3000 tons of universal plates, 6000 tons of bars and axles, wheels, etc., for 2500 box cars. Generally the expectations of business from car building are very moderate.

Reports of fresh price concessions, particularly on plates, are still current and in some lines the customary base has been departed from.

The Bethlehem Steel Co.'s wage reductions of 10 to 20 per cent, effective Jan. 16, are the latest. Pittsburgh and Youngstown reductions are looked for later in the month.

Steel for building shows some life here and there. Two Eastern contracts just let amount to 4600 tons. New projects include 3000 tons for a post office in New York and there is the revival of a Cleveland union bank building, 7000 tons.

New iron and steel capacity under construction at the beginning of 1921 is naturally meager. Only 15 open-hearth furnaces are planned for 1921, with annual capacity of 430,000 tons, and but a single iron blast furnace, capacity 200,000 tons. Last year 20 open-hearth furnaces were completed, with 675,000 tons capacity, and 6 blast furnaces, capacity 875,000 tons. In the four years of the war new open-hearth steel capacity averaged fully 3,500,000 tons a year.

The feeling in the pig iron market in Chicago and Cincinnati is a little more cheerful on account of an increase in inquiries and the withdrawal of some resale iron, but in other centers weakness is more pronounced and prices lower. At Pittsburgh the expected declines of $3 per ton on basic and malleable and $2 on foundry grades are recorded and the market in the South indicates a willingness of some companies to reduce quotations sharply. One of the smaller Southern companies is quoting $30, base, Birmingham, but this is $5 below what has been usual. Charcoal iron is quoted by one large producer at a reduction of $5 from recent furnace prices. The market in the East is extremely dull. Only 48 merchant furnaces in the entire country were in blast Jan. 1, and a number of these will be idle before the end of the month.

The November exports of iron and steel, totaling 434,297 tons for pig iron and rolled steel, make the eleven months' exports of rolled products alone amount to 357,000 tons per month, or over 15 per cent of the country's 1920 production. As most of the exporting independent steel companies allocated only 10 per cent for foreign shipment, the statistics are an indirect indication of the large volume of the Steel Corporation's foreign business.

The recent sharp cut in cast-iron pipe has brought out a few attractive inquiries. Detroit has asked bids on 9000 tons.

Pittsburgh

PITTSBURGH, Jan. 4.

What would otherwise have been a decidedly uneventful week in the steel market was made interesting by the announcement on the last day of the old year by the Republic Iron & Steel Co. of a reduction in standard steel pipe to the basis of the Industrial Board schedule of March 21, 1919. As the independent market on tin plate, bars, shapes, plates, wire products and sheets had previously declined to the Industrial Board basis, the return of the independent market to basic prices was completed in the calendar year without a day to spare, while it had been at about the first of the year that the independent market had begun definitely to advance above the Steel Corporation or Industrial Board prices. The new price lists of Republic on tubular products are dated Dec. 31 while other independent mills are dating their lists Jan. 1, Jan. 3 or later. A noteworthy feature of the decline in tubular goods was

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	Jan. 4, 1921	Dec. 28, 1920	Dec. 7, 1920	Jan. 6, 1920
No. 2X, Philadelphia‡	$34.79	$34.79	$37.79	$44.35
No. 2, Valley furnace†	*33.00*	35.00	37.00	39.00
No. 2, Southern, Cin'ti†	*39.50*	42.50	42.50	40.60
No. 2, Birmingham, Ala.†	*35.00*	38.00	38.00	37.00
No. 2 foundry, Chicago*	*32.00*	33.00	36.00	40.00
Basic, del'd, eastern Pa.	33.86	33.86	35.00	39.00
Basic, Valley furnace	*30.00*	33.00	33.00	36.00
Bessemer, Pittsburgh	*33.96*	36.96	36.96	38.40
Malleable, Chicago*	*32.50*	33.50	36.50	40.50
Malleable, Valley	*32.00*	35.00	37.00	38.00
Gray forge, Pittsburgh	*33.96*	35.96	37.96	38.40
L. S. charcoal, Chicago	43.50	43.50	51.00	45.00
Ferromanganese, Atl. port	*100.00*	110.00	110.00	140.00
Rails, Billets, Etc., Per Gross Ton:				
Bess. rails, heavy at mill	$45.00	$45.00	$55.00	$45.00
O.-h. rails, heavy, at mill	47.00	47.00	57.00	47.00
Bess. billets, Pittsburgh	43.50	43.50	43.50	48.00
O.-h. billets, Pittsburgh	43.50	43.50	43.50	48.00
O.h.-. sheet bars, P'gh.	47.00	47.00	47.00	50.00
Forging billets, base, P'gh.	*48.50*	51.00	56.00	64.00
O.-h. billets, Phila.	49.24	49.24	49.24	59.10
Wire rods, Pittsburgh	57.00	57.00	57.00	60.00
Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia	*3.35*	3.85	4.35	3.745
Iron bars, Pittsburgh	*3.06*	3.38	3.63	3.50
Iron bars, Chicago	*2.68*	3.25	3.25	3.00
Steel bars, Pittsburgh	2.35	2.35	2.35	2.75
Steel bars, New York	2.73	2.73	2.73	3.27
Tank plates, Pittsburgh	2.65	2.65	2.65	2.65
Tank plates, New York	3.03	3.03	3.03	3.02
Beams, etc., Pittsburgh	2.45	2.45	2.45	2.45
Beams, etc., New York	2.83	2.83	2.83	2.82
Skelp, grooved steel, P'gh.	2.65	2.65	3.00	2.45
Skelp, sheared steel, P'gh.	2.65	2.65	3.00	2.65
Steel hoops, Pittsburgh	3.05	3.05	3.05	3.25

Sheets, Nails and Wire,	Jan. 4, 1921	Dec. 28, 1920	Dec. 7, 1920	Jan. 6, 1920
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 28, P'gh.	4.35	4.35	4.35	4.35
Sheets, galv., No. 28, P'gh.	5.70	5.70	5.70	5.70
Sheets, blue an'l'd, 9&10	3.55	3.55	3.55	3.55
Wire nails, Pittsburgh	3.25	3.25	3.25	4.50
Plain wire, Pittsburgh	3.25	3.25	3.25	3.25
Barbed wire, galv., P'gh.	4.10	4.10	4.10	4.45
Tin plate, 100-lb. box, P'gh.	$7.00	$7.00	$7.00	$7.00
Old Material, Per Gross Ton:				
Carwheels, Chicago	*$21.00*	$22.00	$27.00	$34.50
Carwheels, Philadelphia	25.00	25.00	27.00	33.00
Heavy steel scrap, P'gh.	15.00	15.00	19.00	26.00
Heavy steel scrap, Phila.	14.50	14.50	16.00	23.50
Heavy steel scrap, Ch'go	*15.00*	15.50	16.50	24.00
No. 1 cast, Pittsburgh	25.00	25.00	28.00	32.00
No. 1 cast, Philadelphia	22.50	22.50	27.00	33.00
No. 1 cast, Ch'go (net ton)	*17.00*	17.50	18.50	35.50
No. 1 RR. wrot, Phila.	20.00	20.00	20.00	32.00
No. 1 RR. wrot, Ch'go (net)	14.00	14.00	15.50	25.00
Coke, Connellsville,				
Per Net Ton at Oven:				
Furnace coke, prompt	*$5.25*	$5.50	$6.50	$6.00
Furnace coke, future	*6.00*	6.60	6.60	6.00
Foundry coke, prompt	6.50	6.50	7.50	7.00
Foundry coke, future	*8.00*	8.50	8.50	7.00
Metals,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	13.75	13.75	14.00	19.75
Electrolytic copper, N. Y.	*12.75*	13.25	14.00	19.50
Zinc, St. Louis	5.60	5.60	6.25	9.50
Zinc, New York	**6.10**	5.60	6.60	9.85
Lead, St. Louis	**4.75**	4.50	5.00	8.25
Lead, New York	**4.75**	4.50	5.00	8.50
Tin, New York	**36.00**	33.50	35.00	63.50
Antimony (Asiatic), N. Y.	*5.20*	5.25	5.75	9.75

*The average switching charge for delivery to foundries in the Chicago district is 70c. per ton.
†Silicon, 1.75 to 2.25. ‡Silicon, 2.25 to 2.75.

The prices in the above table are for domestic delivery and do not necessarily apply to export business.

that most of the independents still had a considerable volume of business on books, whereas when the other finished steel products declined, the independents were almost bare of shipping orders, having received suspensions or postponements as to most of the unfilled tonnage.

An interesting readjustment in the Valley market on basic and Bessemer pig iron has been effected by a leading producer voluntarily reducing quotations $3 a ton, effective at the opening of business in the new year. The new price is chiefly a reflection of the reduced cost of coke. Prices are regarded now as fairly well stabilized on the basis of costs, and furnaces are indisposed to try to press sales by reducing prices further, preferring to go out of blast.

Operations of independent steel mills in the past week have not averaged altogether as low a rate as had been predicted in some quarters, for it had been thought that nearly all the independents would be closed by the end of the year. While many plants are entirely idle, some have shown a fair rate of operation, up to about 50 per cent. Just at the moment, however, there is no prospect of an immediate increase in independent operations, and it may be that in the next week or two additional capacity will be rendered idle. Predictions confidently made in the past few weeks that there would be a mild revival in buying of steel products after the turn of the year can hardly be verified quickly enough to arrest the decrease in mill operations. The Steel Corporation continues to operate at nearly all its steel plants up to the limit of the physical possibilities, its ingot operations being understood to be above 90 per cent, and most of the Corporation subsidiaries are very well provided with shipping orders.

A few additional wage reductions have been announced at plants in the Pittsburgh district, but in general the tendency of manufacturers is to postpone action on this subject. It seems to be recognized everywhere that wage reductions are dictated by existing circumstances, the real question being as to when reductions should be made effective. Some steel producers express the opinion that if a reduction were made at this time the rates would be found later to be out of line with conditions as they may be developed in the next few weeks.

Pig Iron.—As foreshadowed in last report, a prominent Valley producer of Bessemer and basic pig iron announced at the opening of business this year that it was willing to sell basic pig iron at $30, Valley, and Bessemer and malleable at $32, Valley, whereby the market on these grades is established at a decline of $3 a ton. No sales of consequence are reported. The larger part of the decline may be interpreted as representing a passing on to the consumer of the reduction in cost of production occasioned by the decrease in cost of coke. The common basis for coke contracts for the present half year is a 5 to 1 ratio against basic pig iron, which makes the coke cost $6 per net ton, while the expiring contracts were at considerably higher prices. Some were on a ratio of 4 to 1 against basic pig iron, which with pig iron at $33 made the coke cost $8.25. In foundry iron there have not been enough sales by furnaces to make a clear cut market, but there is no doubt some furnaces would sell at $33 or less, and we quote the market at $33 or $2 below last week's quotation. Resale lots have gone at still less. Six of the merchant furnaces in the Valleys are in operation, but some of these are to go out shortly, when they have made enough iron to take care of known requirements of customers for a short time. W. P. Snyder & Co.

report average prices in December, based on actual market sales in lots of 1000 tons and over at $35, Valley, for Bessemer and at $33, Valley, for basic iron.

We quote Valley furnace, the freight rate for delivery to the Cleveland or Pittsburgh district being $1.96 per gross ton:

Basic	$30.00
Bessemer	32.00
Gray forge	32.00
No. 2 foundry	33.00
No. 3 foundry	32.50
Malleable	32.00

Ferroalloys.—As generally is the case during inactive times, prices of alloys reflect irregularity and show a downward tendency. Domestic ferromanganese and spiegeleisen, as indicated a week ago, declined sharply the latter part of 1920, but have reflected no further weakness. With manufacturers of automobile castings out of the market, demand for Bessemer ferrosilicon and silvery iron is just about nil.

We quote 76 to 80 per cent domestic ferromanganese at $140 to $150, seaboard British, $135 to $140 on direct sales; resale tonnages $100 to $110 seaboard. We quote average 20 per cent spiegeleisen nominal at $58 to $60 furnace, on direct business and $40 to $45 for resale tonnages 50 per cent ferrosilicon, nominal $75 to $80 furnace, freight allowed. Bessemer ferrosilicon is quoted f.o.b. Jackson County and New Straitsville, Ohio, furnaces, as follows: 9 per cent, $61; 10 per cent, $64.50; 11 per cent, $67.80; 12 per cent, $71.10. Silvery iron, 6 per cent, $51.50; 7 per cent, $53; 8 per cent, $55; 9 per cent, $57; 10 per cent, $59.50; 11 per cent, $62.80; 12 per cent, $66.10. The present freight rate from Jackson and New Straitsville, Ohio, into the Pittsburgh district is $4.06 per gross ton.

Billets, Sheet Bars and Slabs.—The market in billets continues absolutely stagnant. The mills are not in receipt of any inquiry, and there is hardly any offering for resale. Slabs are equally stagnant. In sheet bars there is a considerable tonnage still due the sheet mills on old contracts, the price having been reduced to $47, but specifications against these contracts are very light since the mills specify only as they sell sheets. Some of the sheet mills feel that sheet bars should be obtainable at $42, the Industrial Board price, since sheets are down to the prices of the Industrial Board level, and one sheet interest, now idle, is talking of a $40 price. Forging billets have been weakening and are now quotable at $48.50 to $50, base.

We quote 4 x 4-in. soft Bessemer and open-hearth billets at $43.50 to $45; 2 x 2-in. billets, $47 to $48.50; Bessemer sheet bars, $47; open-hearth sheet bars, $47, and forging billets, ordinary carbons, $48.50 to $50 base; slabs, $46; all f.o.b. Youngstown or Pittsburgh mill.

Wire Products.—Demand for wire products is very light all along the line. Independents are booking little business and even the leading interest, despite a large volume of business on books, is not being pressed for deliveries as formerly. While independents have come down to the $3.25 or Industrial Board price on nails, they are very much dissatisfied with the price and predict that nails will be the first thing to advance when the steel market in general stiffens again.

We quote wire nails at $3.25 base per keg, Pittsburgh, and bright basic and Bessemer wire at $3.25 base per 100 lb., Pittsburgh.

Cold-Finished Steel Bars.—Producers are receiving an occasional release on old orders, but very little new business. Operations are at rather a low rate, and are maintained in part by producers replenishing their stocks. The market is steady at 3.60c., base.

Hot-Rolled and Cold-Rolled Strips.—Mill operations are very light and as a matter of fact most hot and cold strip mills are down and have been for nearly a week and many of them have not definitely fixed a date of resumption, contenting themselves to await developments in the way of wage revisions or material market changes. There has been some little scattered buying of hot rolled strips by railroads and implement makers, but mills figure that there is no incentive to cut prices even if there was a cuttable margin, as it would not stimulate buying. One of the strip mills in this district announced a 20 per cent wage reduction, effective Jan. 1, affecting about 1800 men. All makers are holding hot rolled strips at 3.30c. and cold rolled at 6.25c.

Plates.—Until railway officials can properly finance buying programs, rolling schedules of plate mills in the Greater Pittsburgh district will not be increased appreciably. The New York Central Railroad is negotiating tentatively for 5000 underframes and the Cleveland, Indianapolis & Louisville Railway is manifesting interest in 200 gondola cars, but there is no indication at present that either inquiry will develop into an actual order. In fact, car builders and plant managers of foundries supplying railroads with necessary equipment are not at all sanguine about the immediate future. It will be late spring or early summer, they say, before much change in the situation is noted. In the meantime, everything possible is being done to reduce costs, which presages, generally, more active competition. Thus far the 2.65c. price is being maintained on plates all along the line, but that figure, it might be added, has not been tested severely. Demand for industrial cars is just about as quiet as the basic industries themselves.

We quote sheared plates of tank quality ¼ in. and heavier at 2.65c., Pittsburgh, this being the quotation of both the Carnegie Steel Co. and the leading independents.

Iron and Steel Bars.—Both common and refined iron bars show a tendency to drift toward lower price levels in this and adjacent territory. The former have been marked down to 2.68c., Chicago, which means they could be had for 3.06c. here, and the latter now are quotable at 4c., Pittsburgh, as against 4.25c. a fortnight ago. Steel bars still are listed at 2.35c., with most mills asking extras for twisting.

We quote steel bars rolled from billets at 2.35c.; reinforced bars, rolled from billets, at 2.35c., base; common iron bars, 3.06c. to 3.25c., delivered Pittsburgh; refined iron bars, 4c., in carloads, f.o.b. mill, Pittsburgh.

Sheets.—Some of the independent sheet mills had a fair operation last week and on the whole production of sheets by independents is at a somewhat higher rate than was predicted. The leading interest continues to schedule more than 95 per cent of its sheet mills for operation and is well provided with specifications. Many of the independent sheet plants are down entirely and will not resume until they have accumulated a fair volume of specifications, either from releases on suspended orders or from new business. Demand in the open market is very light, but is expected to improve as buyers get through with work on inventories. Prices, which are given on page 101, seem to be well maintained.

Tin Plate.—Demand for tin plate is extremely light. Packers of milk and seasonable goods take rather a gloomy view of the nearby future, being impressed by the fact that there are large stocks of canned goods. There are, however, no stocks of containers or of tin plate. The general line trade, which was very short of supplies three months ago, has now caught up and demand for containers is light in that quarter. Tin plate makers are quite content to let matters take their course and are making no effort to effect sales. They point out that tin plate requirements in a year have never in the history of the industry fallen as much as 20 per cent below the previous record. Last year's production is estimated at somewhat over 32,000,000 boxes, while the record output, made in 1917, was about 34,000,000 boxes. The Industrial Board price of $7 per base box, 100-lb., is being firmly maintained on regular production, while some odds and ends out of stock have gone at the usual concession. The American Sheet & Tin Plate Co. has specifications in hand for between two and three months of work, chiefly against contracts that could not be completed last year, and is scheduling about 80 per cent of its tin mills for operation. Three of the largest independents are closed entirely and have been for two weeks or more, while the average operation of all the independents is only 20 or 25 per cent. Prices of terne plate are given on page 101.

Iron and Steel Pipe.—On the morning of Dec. 31 the Republic Iron & Steel Co. announced a reduction in its prices on standard steel pipe to the Industrial Board or Steel Corporation level, distributing new discount cards dated Dec. 31. Other independent pipe mills have been following this lead, some dating their cards Jan. 1 and others Jan. 3. Some of the mills were still well supplied with orders, but state that prices were reduced in order to complete the revision in finished steel prices, as other finished products in the independent market had already declined to the Industrial Board level. The great majority of independents had been following a card on steel pipe issued last January, carrying a basing discount of 54 per cent, and pricing all

sizes at 3½ points less discount than the Industrial Board list, so that the new card, on a 57½ per cent basing discount, represents a uniform reduction of about $7 a ton. One or two mills, however, had still higher prices than the 54 per cent card. In oil country goods, including casing, drive pipe, tubing and 2-in. oil and gas line pipe, the new prices are the same as those on the No. 2 card of the National Tube Co. dated August 26, 1920, at the time freight rates were advanced, as these goods are priced on a delivered basis, so that present prices represent Industrial Board prices plus an allowance for the freight advance. On standard steel pipe and water well casing, the discounts are the same as those issued by the National Tube Co. and the independents under date of March 21, 1919, at the time of the Industrial Board arrangement. One mill in the Wheeling district while reducing prices on standard steel pipe has not made the reduction on oil country goods. The pipe mills have been operating substantially at full rate and expect to continue to do so. Some have business on books to occupy them for several months. Discounts are given on page 101.

Coke.—Since the contracting for furnace coke for the first half of the new year recently reported, this kind of business has fallen flat. Furnaces without contracts are indisposed to negotiate and coke operators are making no effort to induce them to do so. Nearly all the furnaces that are without contracts are idle, but here and there a furnace has a contract for January or for three months. Most operators are willing to make contracts on the general basis of a ratio of 5 to 1 against basic pig iron at valley furnaces, which was the basis of the recent contracting, but there are reservations, referring to a minimum price below which coke would not go, and calling also for a stiffer proportion in case pig iron advances. One large interest will do 5 to 1 only when pig iron is $30 or less. The basic iron market became established this week at $30, valley, or $3 decline, so that if this price continues for the month of January shipments of coke on the contracts recently made will be billed at $6. There is very little inquiry for spot furnace coke, though perhaps a trifle more than last week. While operators are averse to selling any coke at less than $6, and have been curtailing production accordingly, odd lots can be picked up at less and we quote the spot furnace coke market at $5.25 to $5.50. Spot foundry coke is quotable at $7 to $7.50, and some good brands can be picked up within this range, buyers having a wider choice at such prices than a week or two ago. Two or three operators are quoting higher prices.

Nuts, Bolts and Rivets.—This branch of the industry has practically been marking time with operations running from 60 to 80 per cent on old orders, and new specifications light. The railroads have been buying a little right along but in small quantities. There are a few indications of a slight pickup but nothing that would point to an early resumption of buying. Prices and discounts are unchanged as given in f.o.b. Pittsburgh table on page 101.

Old Material.—With the low rate of melt by steel plants which, aside from the Steel Corporation, are running between 20 and 45 per cent, the demand is extremely light. Scrap quotations are purely nominal and consumers are getting into their accumulated stocks on hand. A 10,000 tons stock with normal operation would be considered low but on a 25 per cent operating basis it looks big. Until there is an increased melt, brought about by accelerated demand for finished material, there is little likelihood of a better demand for old material, and while one steel plant has been nibbling with a tentative offer of about $1 per ton under quoted prices for heavy melting steel, no scrap has been offered and the nibble is taken as indication of a feeler to see if present quotations could be shaded. Pig iron, after all, is the real key to the situation and with price uncertainty in this branch, there is no buying tendency and no inducement for a move. Both buyers and sellers are standing pat.

We quote for delivery to dealers' yards in the Pittsburgh and other districts taking the Pittsburgh freight rate as follows:

Heavy melting steel, Steubenville, Follansbee, Brackenridge, Monessen, Midland and Pittsburgh	$15.00 to $16.00
No. 1 cast, cupola size	25.00 to 26.00
Rerolling rails, Newark and Cambridge, Ohio; Cumberland, Md.; Parkersburg and Huntington, W. Va.; Franklin, Pa., and Pittsburgh	17.00 to 18.00
Compressed sheet steel	13.00 to 14.00
Bundled sheet sides and ends, f.o.b. consumers' mills Pittsburgh district	11.00 to 12.00
Railroad knuckles and couplers	15.50 to 16.50
Railroad coil and leaf springs	16.00 to 17.00
Railroad grate bars	17.00 to 18.00
Low phosphorus melting stock, bloom and billet ends, heavy plates ¼ in. and heavier	24.00 to 25.00
Railroad malleable	16.00 to 17.00
Iron car axles	36.00 to 37.00
Locomotive axles, steel	32.00 to 33.00
Steel car axles	22.00 to 23.00
Cast iron wheels	23.00 to 24.00
Rolled steel wheels	15.50 to 16.50
Machine shop turnings	10.00 to 10.50
Sheet bar crop ends at origin	16.00 to 17.00
Heavy steel axle turnings	15.00 to 16.00
Short shoveling turnings	13.00 to 14.00
Heavy breakable cast	19.00 to 20.00
Stove plate	17.00 to 18.00
Cast iron borings	13.00 to 14.00
No. 1 railroad wrought	16.00 to 17.00

Cincinnati

CINCINNATI, Jan. 4.

Pig Iron.—A number of inquiries were received in Monday morning's mail and it is hoped the market will now steadily emerge from the slump of the past few months. An encouraging sign from the standpoint of the furnace operators particularly is the withdrawal of some of the resale iron that has been glutting the market. One seller, having an order for a small tonnage which he had expected to be able to fill with resale iron called up a number of melters who had been offering iron and endeavored to purchase enough to supply the needs of his customers. In all cases he was told that the iron was not now for sale, the melters deciding that as they did not get rid of it before Jan. 1, they would use it in their own foundries. It is a little early yet to determine how much of this resale iron will remain in the market, but the general opinion seems to be that as losses involved in selling it below its purchase price cannot now be charged against last year's operations, the major portion of it will be withdrawn. One Southern furnace last week quoted $35, Birmingham, on a small tonnage and it is said that several others are willing to take on business at the same figure. On resale Southern iron, tonnages of which are limited, $34 can still be done. In the North it is reported that a Valley furnace had offered to sell a local broker a round tonnage of foundry iron at $31, base. While nothing definite can be learned, it is reported that under $32, delivered, was done on 1000 tons of foundry bought for a Detroit radiator plant. One Detroit furnace is said to have quoted $33, base, on this inquiry. A furnace operating in southern Ohio, which had been quoting $38, reduced its price to $35 last week, and this appears to be the minimum furnace quotation. Resale iron, however, is still available at $32, Ironton basis. While Jackson County silvery furnaces continue to quote $50, furnace, for 8 per cent, a resale of 10 per cent silvery was offered last week at $51.50. No inquiries for basic have been received to test the market, but resale iron has been offered at $30, Valley furnace. A sale of a small tonnage of resale malleable is reported at $33, southern Ohio furnace. The lower quotations below represent resale prices and on the higher, furnace quotations.

Based on freight rates of $4.50 from Birmingham and $2.52 from Ironton, we quote f.o.b. Cincinnati:

Southern coke, sil. 1.75 to 2.25 (base price)	$38.50 to $39.50
Southern coke, sil. 2.25 to 2.75 (No. 2 soft)	37.25 to 38.25
Ohio silvery, 8 per cent sil.	49.52 to 52.52
Southern Ohio coke, sil. 1.75 to 2.25 (No. 2)	34.52 to 37.52
Basic northern	32.52 to 35.52
Malleable (nominal)	35.52 to 37.52

Finished Iron and Steel.—Sheet makers in this dis-

trict report business as having greatly improved during the week, and the aggregate tonnage booked for the first quarter of the year was satisfactory. Blue annealed and galvanized sheets comprised the bulk of the orders placed, black sheets not being at all active. Some orders have also been placed for steel bars and wire products. Plates and structural shapes are quiet. The pipe market continues to show some activity, and while mill shipments have improved very considerably some sizes are still difficult to get. The Republic Iron & Steel Co. announced on Dec. 31 that, effective at once, prices on wrought steel pipe would be reduced to the level quoted by the National Tube Co. Most of the independent companies now have reverted to the old Industrial Board schedules for all products, and while rumors are current that prices have been shaded on sheets, hoops and bands, no confirmation can be had. Some buyers confidently expected to be able to place their first quarter needs at lower than the March 21, 1919, price, but all business booked during the week has been at the full schedule. Steel plants in the southern part of the State are preparing to resume operations after the holiday shutdown. The American Rolling Mill Co. commenced operations Jan. 2, after a 10-day shutdown for repairs. The sheet mills will operate at full capacity, with the open hearth department running about 60 per cent. Cold ingots will be worked off before the full number of furnaces are charged. The Newport Rolling Mill Co. and the Andrews Steel Co. are scheduled to resume on Jan. 10, and the Whitaker-Glessner mills at Portsmouth are expected to be operating before the end of the week.

Iron and steel bars, 3.58c. base; shapes, 3.68c. base; hoops and bands, 3/16 in. and lighter, 4.28c.; plates, 3.88c. base; reinforcing bars, 3.65c.; cold-rolled rounds, 1½ in. and over, 5.20c.; under 1½ in. rounds, flats, squares and hexagons, 5.70c.; No. 10 blue annealed sheets, 4.78c. base; 28-gage black sheets, 6c. base; 28-gage galvanized sheets, 7c. base; wire nails, $4 per keg, base.

Warehouse Business.—Local warehouses report business dull during the holidays. A number of plants which ordinarily are good buyers were closed down for the holidays, and this accounts largely for the very slack period. It is expected that business will improve now that inventory time is over. No price changes have been made.

Coke.—Some inquiries for coke have been received, among them being one for 12,000 tons for shipment during the first half. Connellsville furnace coke for spot shipment ranges from $5 to $6, and foundry $7 to $8.

Old Material.—The scrap market continues dull, though an occasional sale of carload lots is reported. Dealers report that very little scrap is being accumulated, and that offerings as a consequence are small. Machinery cast has been reduced $2, and some foundries are buying this grade direct from producers at about the same prices dealers are offering.

We quote dealers' buying prices:

Per Gross Ton		
Bundled sheets	$7.50 to	$8.50
Old iron rails	16.50 to	17.50
Relaying rails, 50 lb. and up	45.50 to	46.50
Rerolling steel rails	12.50 to	13.50
Heavy melting steel	12.50 to	13.50
Steel rails for melting	12.50 to	13.50
Car wheels	19.50 to	20.50
Per Net Ton		
No. 1 railroad wrought	11.50 to	12.50
Cast borings	6.50 to	7.00
Steel turnings	4.00 to	4.50
Railroad cast	16.50 to	17.50
No. 1 machinery	18.50 to	19.50
Burnt scrap	8.50 to	9.50
Iron axles	23.00 to	23.50
Locomotive tires (smooth inside)	11.00 to	12.00
Pipes and flues	7.50 to	8.00
Malleable cast	10.50 to	11.00
Railroad tank and sheet	6.50 to	7.00

The Sharon, Pa., plant of the Savage Arms Corporation suspended Dec. 31 to reopen Jan. 15 under new management. For the past few months operations have been of a minor character. The works will continue the production of steel automobile and motor truck frames, automobile clutches and small crankshafts.

St. Louis

ST. LOUIS, Jan. 3.

Pig Iron.—The closing week of the year and the prevalence of inventory taking, holiday interruption and other general factors as well as the continuance of the conditions already noted in the foundry and allied business of this territory brought no change in the pig iron situation.

Finished Iron and Steel.—Mill representatives, while continuing to refuse to cancel contracts are co-operating with users of steel in readjusting their contracts to conditions. Movement out of warehouse was fair for the season of the year and the general conditions prevailing. For stock out of warehouse we quote as follows:

Soft steel bars, 3.57½c.; iron bars, 3.57½c.; structural material, 3.67½c.; tank plates, 3.87½c.; No. 10 blue annealed sheets, 4.77½c.; No. 28 black sheets, cold-rolled, one pass, 6.10c.; No. 28 galvanized sheets, black sheet gage, 7.45c.

Old Material.—The scrap market is still without life and there is no trading of any character among the dealers as there is no disposition to lay down material in the yards. Local dealers are getting their inventories and trial balances in order and are doing as little as possible. Prices as quoted are only estimates of value and there is no way to determine what figures would be made in actual transactions because of the complete lack of interest of consumers in scrap.

We quote dealers' prices, f.o.b. consumers' works, St. Louis industrial district, as follows:

Per Gross Ton		
Old iron rails	$22.00 to	$22.50
Old steel rails, rerolling	17.00 to	17.50
Old steel rails, less than 3 ft.	16.00 to	16.50
Relaying rails, standard section, subject to inspection	35.00 to	40.00
Old car wheels	30.00 to	30.50
No. 1 railroad heavy melting steel scrap	14.00 to	14.50
Heavy shoveling steel	13.00 to	13.50
Ordinary shoveling steel	12.50 to	13.00
Frogs, switches and guards cut apart	14.00 to	14.50
Per Net Ton		
Ordinary bundled sheet	8.00 to	8.50
Heavy axle and tire turnings	8.00 to	8.50
Iron angle bars	22.00 to	22.50
Steel angle bars	14.00 to	14.50
Iron car axles	30.00 to	30.50
Steel car axles	20.00 to	20.50
Wrought arch bars and transoms	22.00 to	22.50
No. 1 railroad wrought	16.50 to	17.00
No. 2 railroad wrought	16.00 to	16.50
Railroad springs	13.50 to	14.00
Steel couplers and knuckles	15.50 to	16.00
Locomotive tires, 42 inches and over, smooth inside	12.50 to	13.00
No. 1 dealers' forge	11.00 to	11.50
Cast iron borings	8.00 to	8.50
No. 1 busheling	15.00 to	15.50
No. 1 boilers, cut to sheets and rings	9.00 to	9.50
No. 1 railroad cast scrap	18.50 to	19.00
Stove plate and light cast scrap	16.00 to	16.50
Railroad malleable	12.75 to	13.25
Agricultural malleable	12.75 to	13.25
Pipes and flues	10.50 to	11.00
Railroad sheet and tank scrap	8.00 to	8.50
Railroad grate bars	13.00 to	13.50
Machine shop turnings	5.00 to	5.50
Country mixed scrap	9.00 to	9.50
Uncut railroad mixed scrap	9.50 to	10.00
Horseshoes	16.50 to	17.00
Railroad brake shoes	13.00 to	13.50

Birmingham

BIRMINGHAM, ALA., Jan. 3.

Pig Iron.—Growing restive under the continued indifference of the trade to offers of iron at $38, one maker has announced intention of sending sales agents direct to consumers in an effort to ascertain at what figure some real business may be done with a view to going as far as cost of production will allow to meet the consumer. The Birmingham makers now admit that $38 is no more a fixed base than $42 was some time ago, except that they have the Steel Corporation's backing of that base in business already booked. Undoubtedly initial business, if of attractive volume, can be booked under $38; how far under would depend on character of business offered. Release orders have been encouraging, but they still fail to cover much of the held-up tonnage. Some inquiries of an apparently genuine nature coming about the middle of the month are now taken to have been a sounding out of the market with a view to proper value of inventories on consumers' yards. The Shelby Iron Co., operating the

only charcoal stack on the active list, blew that out on Dec. 23, and no charcoal iron is being manufactured in Alabama now. A substantial movement of charcoal stocks on hand is being made on business booked during a recent buying flurry on the part of wheel makers, but they quit with the same accord that they entered and for a time bought metal. There is no indication of a departure from normal operations in iron and steel by the Steel Corporation's auxiliaries, a continuance of whose large export business is indicated by the booking of five steamers to carry 30,000 tons of steel products out of Mobile alone in the next 60 days. The average of steel products shipments for export by the Steel Corporation has been around 12,000 to 15,000 tons monthly. The Birmingham district may be said to have entered the year with absolute darkness as to pig iron, but in a safe way incident to Corporation activities. Independent steel producers are very slow in securing new business, even at the Corporation levels.

We quote per gross ton f.o.b. Birmingham district furnace, the Tennessee company included, as follows:

Foundry, sil. 1.75 to 2.25	$38.00
Basic	37.00
Charcoal	50.00

Cast Iron Pipe.—Sanitary pipe shops with one accord followed the lead of the Central Foundry and a leading Chattanooga maker in accepting the new scale of $75 per ton, a reduction from the high level of $100 and $110. These shops will be slow to resume, having some stocks on hand. All water and gas pipe producers seem to have accepted the new base of $55 and $60 for water pipe with $4 added for gas pipe.

Coal and Coke.—Year's production of coal in Alabama has approximated 15,500,000 tons, which is about 2 per cent under the production of 1919. Car shortage in the early spring counts for the loss of at least 1,000,000 tons. Loss occasioned by the strike was negligible, as was shown by a record December production and a Christmas week output far ahead of prior record in any year. Forty to fifty strikers are in the toils of the law for offenses from murder down and the strike is losing ground all the time. It is only a question of how long the international union thinks well of throwing away $300,000 to $400,000 per month in Alabama, a large portion of which goes to farmers with whom mining is only a side line, but who draw rations just the same.

Old Material.—The scrap market is dead, and prices are nominal.

We quote per gross ton f.o.b. Birmingham district yards, prices to consumers, as follows:

Old steel rails	$17.00 to $18.00
No. 1 heavy steel	16.00 to 17.00
No. 1 cast	27.00 to 28.00
Car wheels	27.00 to 28.00
Tramcar wheels	25.00 to 26.00
No. 1 wrought	21.00 to 22.00
Stove plate	14.00 to 15.00
Cast iron borings	7.00 to 8.00
Machine shop turnings	7.00 to 8.00

Buffalo

BUFFALO, Jan. 4.

Pig Iron.—Heavier inquiry and a more optimistic feeling are noted in this market in the week just closed. A sales manager for a large local producer returned from a trip among pig iron users, said belief was general that business would improve after holiday vacations. The same producer reported a sale of slightly in excess of 1000 tons of iron at $35 base, with some at $36. One sales agency reported an inquiry for 200 to 300 tons of No. 2 foundry. It is not believed sales of resale iron will continue long after the first of the year and that buyers will become active. Furnace operation is no livelier.

We quote f.o.b. Buffalo as follows:

No. 1 foundry, 2.75 to 3.25 sil	$37.00 to $38.00
No. 2X foundry, 2.25 to 2.75 sil	35.25 to 36.25
No. 2 plain, 1.75 to 2.25 sil	34.00 to 35.00
Basic	36.00
Malleable	35.00 to 36.00
Lake Superior charcoal	55.00

Old Material.—Prices have weakened without any resulting flurry among buyers. Heavy melting steel is quoted at $15 to $16. There has been an absolute withdrawal from the market of large buyers and among smaller purchasers there is considerable dickering before orders are placed.

We quote dealers' asking prices per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel	$15.00 to $16.00
Hydraulic compressed	14.00 to 15.00
Low phos., 0.04 and under	25.00 to 26.00
No. 1 railroad wrought	22.00 to 23.00
No. 1 machinery cast	26.00 to 27.00
Iron and steel axles	30.00
Car wheels	24.00 to 25.00
Railroad malleable	18.00 to 19.00
Machine shop turnings	11.00 to 12.00
Heavy axle turnings	15.00 to 16.00
Clean cast borings	12.00 to 13.00
Iron rails	25.00 to 26.00
Locomotive grate bars	15.00 to 16.00
Stove plate	17.00 to 18.00
Wrought pipe	14.00 to 15.00
No. 1 busheling	14.00 to 15.00
Bundled sheet stampings	10.00 to 11.00

British Iron and Steel Market

More Plants Down—Pig Iron Rvisions Next Week—Continental Competition

(By Cable)

LONDON, ENGLAND, Jan. 4.

Some Scotch works have closed indefinitely and others are down until Jan. 10.

The revision of Cleveland and Midland pig iron prices is expected next week.

The Continent is scrambling to secure orders. Billets have been offered at £10 f.o.b., but few buyers are being found, as the opinion is ruling that the bottom has not yet been reached.

Foreign ore is quiet. Best Rubio is quoted at 49s. to 50s., ex-ship Tees.

Tin plates are dull. Stock plates have sold at 33s. base, f.o.t. Many mills are closed, but some finishing departments are continuing for a short period. Galvanized sheets are quiet and are nominally at £30.

We quote per gross ton except where otherwise stated, f.o.b. maker's works, with American equivalent figured at $3.54 for £1, as follows:

Ship plates	£24	10	to	£28	0	$86.73	to	$99.12
Boiler plates	31	0	to	33	0	109.74	to	116.82
Tees	25	0	to	27	0	88.50	to	95.58
Channels	24	5	to	26	5	85.84	to	92.92
Beams	24	0	to	26	0	84.96	to	92.04
Round bars, ¾ to 3 in.	26	10	to	29	10	93.81	to	104.43
Rails, 60 lb. and up	25	0	to	27	0	88.50	to	95.58
Billets	15	10	to	16	10	54.87	to	58.41
Sheet and tin plate bars, Welsh	16	0	to	17	10	56.64	to	61.95
Galvanized sheets, 24 g.	30	0				106.20		
Black sheets, 24 g.	34	10				122.13		
Tin plate base box	1	14				6.01		
Steel hoops	27	0				95.58		
Cleveland basic iron	11	15				41.58		
West Coast hematite	13	15				48.68		
Cleveland No. 3 foundry	12	7½				43.80		
Ferromanganese	32	0	to	33	0	113.28	to	116.82
Coke	3	2¾				11.11		

Boston

BOSTON, Jan. 4.

Pig Iron.—The new year opens with a still further contraction in sales. The range of prices on the little iron sold since last reports was narrower than heretofore, due largely to the fact that it was mostly No. 2X iron. Sales for the week include a car of silicon 2.25 to 2.75 at $39 delivered, or $32.50 Buffalo furnace. Offerings of Buffalo at $34 furnace base have failed to attract buyers. Virginia No. 2X iron sold at $33 furnace or $39.58 delivered. No. 2 plain Virginia is offered at $29 furnace or $35.58 delivered. A car of No. 2X eastern Pennsylvania and Southern iron mixed sold at $34.25 delivered. Foundries, generally speaking, are doing less than they have before in many months, but an improvement in business is expected within the near

future. One New England melter signifies his intention of purchasing 3000 tons of iron this quarter. Delivered prices on resale iron follow:

East. Penn., sil. 2.25 to 2.75	$40.31 to $43.31
East. Penn., sil. 1.75 to 2.25	39.06 to 42.06
Buffalo, sil. 2.25 to 2.75	38.71 to 41.71
Buffalo, sil. 1.75 to 2.25	37.46 to 40.46
Virginia, sil. 2.25 to 2.75	39.58 to 41.83
Virginia, sil. 1.75 to 2.25	38.33 to 40.58
Alabama, sil. 2.25 to 2.75	47.91 to 49.91
Alabama, sil. 1.75 to 2.25	46.66 to 48.66

Old Material.—Approximately 1000 tons of old material was sold at the local navy yard. Of this amount, H. Rubenstein, Chelsea, Mass., bought 200 tons of plates in charging sizes at 63½c. per 100 lb., 150 tons drop forgings at 48½c. per 100 lb., and 100 tons of steel plate at 58½c. per 100 lb., and the Massachusetts Metal & Rubber Co., Chelsea, 200 tons shoveling steel at 63½c. per 100 lb. Smaller tonnages of structural were purchased at 58½c. per 100 lb., galvanized pipe at 36c., light iron at 28½c., tank and stacks at 31½c., and turnings at 31¼c. Little of interest has happened in this market otherwise. Two cars of rerolling rails sold at $14, and the Crane Co., Bridgeport, Conn., is in the market for 200 tons of railroad malleable. Local yard prices on old material follow:

No. 1 heavy melting steel	$9.00 to $10.00
No. 1 railroad wrought	18.00 to 19.00
No. 1 yard wrought	16.00 to 17.00
Wrought pipe (1-in. in diameter, over 2 ft. long)	9.50 to 10.50
Machine shop turnings	9.00 to 9.50
Cast iron borings, rolling mill	9.00 to 10.00
Cast iron borings, chemical	11.00 to 12.00
Heavy axle turnings	9.00 to 9.50
Blast furnace borings and turnings	6.00 to 7.00
Forged scrap	7.00 to 8.00
Bundled skeleton	7.00 to 8.00
Street car axles, steel	18.00 to 19.00
Car wheels	29.00 to 30.00
Machinery cast	27.00 to 28.00
No. 2 cast	24.00 to 26.00
Stove plate	19.00 to 20.00
Railroad malleable	15.50 to 16.50
Rerolling rails	13.00 to 14.00

New York

NEW YORK, Jan. 4.

Pig Iron.—So far as there are any developments, they are toward increased weakness, but the market is so nearly lifeless that the developments are not important. The largest inquiry reported is for 400 tons of foundry iron for January-February delivery, while other inquiries range from a few carloads to 200 tons. On eastern Pennsylvania $1 to $1.50 lower than recent quotations, or about $35 to $35.50, delivered in New York, for No. 2 foundry can be done. Reports of iron being available on a basis of $30, Buffalo, are persistent. Resale iron continues an important factor.

We quote delivered in the New York district as follows, having added to furnace prices $2.52 freight from eastern Pennsylvania, $5.46 from Buffalo and $6.16 from Virginia:

East. Pa. No. 1 fdy., sil. 2.75 to 3.25	$38.02 to $39.52
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	36.27 to 37.77
East. Pa. No. 2 fdy. sil. 1.75 to 2.25	35.02 to 36.52
Buffalo, sil. 1.75 to 2.25	37.46 to 38.46
No. 2 Virginia, sil. 1.75 to 2.25	42.16 to 43.16

High Speed Steel.—A slightly better tone is noted by most producers. A few more inquiries are being received than for some time, one company noting an inquiry for more than 4000 lb. After Jan. 15 revision to a stable price is expected. Producers quote 18 per cent tungsten high speed steel at $1.25 per lb., New York, which is nominal, fair sized orders bringing lower quotations.

Finished Iron and Steel.—Year-end business in all branches of the steel trade was quiet, though a slightly better inquiry for small lots for prompt shipment greeted sales offices on the first business day of the new year. The improvement, however, is too slight to indicate any definite trend toward more activity. The local trade is pretty well resigned to the thought that the recovery from the present depression will be slow. It is admitted that on some products lower prices may become necessary to induce buying. A new competitive factor, particularly in plates, is the tonnage of resale material, originally bought for export, but held up at Atlantic ports because of cancellations from abroad. At one time recently it was estimated that close to 50,000 tons of various forms of steel was stored in the vicinity of New York, much of it held by banks as security for loans. In structural shapes there is a little increase in business, but nothing like enough to keep the mills busy. The Travelers Insurance Co. Building, Hartford, Conn., which has been in the market for some time, has finally been released, the contract for fabricating, about 2400 tons, having been awarded to the Levering & Garrigues Co. The American Bridge Co. was awarded the Piscataqua River bridge, near Portsmouth, N. H., about 2200 tons. Projects in the market include about 3000 tons for a post office building on Varick Street, New York; 400 tons for a crane runway at the Brooklyn Navy Yard, on which bids will close Jan. 5, and 400 tons for an acid plant at Columbus, Ohio. The new year has brought out no new car business other than an inquiry for wheels, axles, etc., for 2500 box cars to be built by the Lenoir Car Works for the Southern Railway. New lettings of rails include about 4000 tons for the El Paso & Southwestern, which went to the Colorado Fuel & Iron Co. The United States Steel Products Co. is reported to have taken 8000 tons of rails for shipment to China. The same company is also reported to have booked about 40,000 boxes of tin plate for Japan. In the face of the unfavorable conditions for exporting, steel exporters are largely playing a waiting game. Bar iron prices are nominal through lack of business to test them; most quotations are 3.50c., Pittsburgh, with 3.25c. and 3c. occasionally named.

We quote for mill shipments, New York, as follows: Soft steel bars, 2.73c.; plates, 3.03c.; shapes, 2.83c.; bar iron, flats, wider than 6 in., 3.88c. to 4.38c., with half extras; light rounds, squares and flats, 4.38c. to 4.88c., with full extras, and other sizes, 3.38c. to 3.88c., with half extras.

Ferroalloys.—The market for ferromanganese is devoid of new business. While the last quotation for the British alloy is $110, seaboard, it is believed that desirable business could be done on the basis of $100, seaboard. It is also stated that some resale alloy was disposed of in the last week at $90, but that special considerations surrounded this transaction. Imports continue heavy, having been 7091 tons last November, bringing the total to 53,830 tons for the 11 months of last year against 29,595 tons for the same period in 1919. Exports were fairly large in November, having been 760 tons. The spiegeleisen market is exceedingly quiet, the only transaction reported having been one for about 100 tons in addition to the 200 tons reported a week ago. The high grade alloy is obtainable as low as $45, furnace, and it is possible that this could be shaded on desirable business. The manganese ore market is devoid of feature and quotations are unchanged at around 35c. to 40c. per unit, seaboard. Importations continue heavy, having been 74,477 tons last November, making the total for the first 11 months 542,189 tons against 296,968 tons to Dec. 1, 1919. The 50 per cent ferrosilicon market is quiet at around $80 per ton, delivered. News regarding transactions for this year's delivery is expected shortly. Quotations for lump ferrotungsten, guaranteed, are 59c. per lb. of contained tungsten. Ferrovanadium is quoted at $6 to $7 per lb. of contained vanadium in wholesale lots for early delivery, but these are nominal, the alloy being exceedingly scarce. Ferrocarbontitanium, 15 to 18 per cent, is selling at $200 per net ton in carload lots, at $220 per ton in lots between one ton and a carload, and at $250 per ton in lots less than a ton, f.o.b. Suspension Bridge, N. Y.

Cast-Iron Pipe.—Business has fallen very flat. Plants which have old orders to fill are running at a small fraction of capacity, perhaps 25 per cent. Other plants are shut down completely. One month's business ahead seems to be the maximum. It seems that buyers of pipe are waiting for the pig iron market to become stabilized. One note of optimism is the expected buying from New England municipalities now

that new city officials assumed power on Jan. 1 in many cases. We quote f.o.b., New York, as follows: 6-in. and larger, $63.30; 4-in., $73.30; 3-in., $83.30, with $4 additional for Class A and gas pipe.

Old Material.—Price declines, though more gradual, continue. An eastern Pennsylvania mill has been offering as low as $13.50 for heavy melting steel, though at present is out of the market. Wrought iron track, borings and turnings, stove plate and car wheels have been lowered from 50 cents to $1.00. Occasionally a sale is made to a mill, as for instance 500 tons of heavy melting steel at $16 delivered, the freight being $5.

Warehouse Business.—Very little business was transacted during the holiday week. With the mill prices on sheets down, warehouses, including the leading independent, have made a reduction of 35c. per 100 lb. on galvanized sheets, 30c. per 100 lb. on blue annealed, and 50c. per 100 lb. on black sheets. Refined iron bars have been generally reduced to 4.25c. per lb. and hoops have been dropped from 4.70c. to 4.65c. per lb. Brass and copper sheets and brass rods, tubes and wire are off 1c. per lb. With the Republic Iron & Steel Co.'s Dec. 31 reduction of $4 per ton on wrought iron and steel pipe, bringing its prices to the Corporation level, warehouses look forward to similar reductions by other mills and a corresponding revision by warehouses. We quote prices on page 120.

Buying prices per gross ton, New York, follow:

Heavy melting steel	$10.00 to $10.50
Rerolling rails	13.50 to 14.00
Relaying rails, nominal	50.00 to 53.00
Steel car axles	17.00 to 18.00
Iron car axles	32.00 to 33.00
No. 1 railroad wrought	16.00 to 17.00
Wrought iron track	10.00 to 10.50
Forge fire	9.00 to 9.50
No. 1 yard wrought long	13.00 to 14.00
Light iron	5.00 to 6.00
Cast borings (clean)	9.50 to 10.50
Machine-shop turnings	9.00 to 9.50
Mixed borings and turnings	7.50 to 8.00
Iron and steel pipe (1 in. diam. not under 2 ft. long)	10.00 to 11.00
Stove plate	16.00 to 17.00
Locomotive grate bars	14.00 to 15.00
Malleable cast (railroad)	13.00 to 14.00
Old car wheels	22.00 to 23.00

Prices which dealers in New York and Brooklyn are quoting to local foundries, per gross ton:

No. 1 machinery cast	$24.00 to $25.00
No. 1 heavy cast (columns, building materials, etc.) cupola size	24.00 to 25.00
No. 1 heavy cast, not cupola size	14.00 to 15.00
No. 2 cast (radiators, cast boilers, etc.)	15.50 to 16.00

Cleveland

CLEVELAND, Jan. 3.

Iron Ore.—Very little ore is moving from Lake Erie docks, as only a few consumers are taking shipments. Ore receipts at Lake Erie ports during 1920 were 44,833,200 tons as compared with 36,874,316 tons during 1919. During the past year, receipts at other than Lake Erie ports were 13,214,961 tons as compared with 9,998,475 tons during 1919. Lake front furnaces at Lake Erie ports during 1920 took 9,368,299 tons as compared with 7,459,169 tons during the previous year. There was a further slowing down in mine operations during the week, a few mines having shut down entirely and others reducing their operations to one shift. Readjustment of miners' wages are being considered by independent companies, but reductions will probably not be made within the next week or two.

We quote delivered lower lake ports: Old range Bessemer, $7.45; old range non-Bessemer, $6.70; Mesaba Bessemer, $7.20; Mesaba non-Bessemer, $6.55.

Pig Iron.—Furnaces have started the new year with a large tonnage of last half iron carried over on their order books, very few new orders for the first half and large stock piles. Many of the suspensions made in the past few months were until January, and some of the furnaces are now asking consumers if they are ready to take the iron, but it is not expected that much will be released this month. Pig iron consumption in this territory will be further curtailed by the shutting down of the plant of the Ford Motor Co. Some of the foundries making castings for the Ford company have been instructed to discontinue the shipment of castings until Feb. 1. The insistence of buyers that furnaces readjust prices on old contracts has become very general, although some consumers have expressed their willingness to take the iron on their high priced contracts as soon as possible, and one producer received orders during the week to ship 350 tons of $46 and $48 iron that was held up some time ago. All requests that old contracts be readjusted to present price levels are being refused. Sales during the week were limited to a few carlots of foundry iron. Several inquiries came out, including one from the General Electric Co. for 500 tons of prompt shipment foundry iron, but most of the inquiries are apparently being put out only for inventory purposes. Furnaces generally are quoting foundry iron at $35, although one $34 quotation has appeared. Resale iron is not so much in evidence as a few weeks ago, but a Detroit automobile company is understood to have sold some malleable iron at $31 and is offering more at the same price. A Tennessee furnace is now quoting Southern foundry iron at $35 base, but this price can probably be shaded. A Valley producer has reduced its price on standard low phosphorus iron to $45 and has sold a 200 ton lot at that price. The number of active furnaces continues to decrease. The Hanna Furnace Co. blew out its Dover furnace, Dover, Ohio, December 31, and two furnaces of the McKinney Steel Co., one River in Cleveland and Scottdale, Scottdale, Pa., went out Dec. 29. The Otis Steel Co. will probably blow out both of its Cleveland furnaces about January 15.

We quote delivered Cleveland as follows, based on the new freight rates, these being a 56c. switching charge for local iron, a $1.96 freight rate from Valley points, a $3.36 rate from Jackson and $6.67 from Birmingham:

Basic	$34.96
Northern No. 2 fdy., sil. 1.75 to 2.25	$33.96 to 35.96
Southern fdy., sil. 2.25 to 2.75	41.92 to 42.92
Ohio silvery, sil. 8 per cent	53.36 to 58.36
Standard low phos., Valley furnace	45.00

Sheets.—Inquiries for sheets have been a little more plentiful since the first of the year. However, no business is coming from the automobile field and the Ford Motor Co., which announced to the trade that it would be in the market in January, has deferred making purchases until next month. While there are reports that one mill is willing to shade prices, most independent sheet producers are firmly refusing to quote below regular prices. The largest independent producer in the Mahoning Valley is operating its plant at slightly over 50 per cent of capacity, but a number of sheet mills are shut down.

Finished Iron and Steel.—There is very little activity in any finished line, but a little improvement is expected now that the holiday season is over and manufacturing plants that were shut down for several days have resumed operations. None of the local steel plants that shut down in December has as yet started up or made plans for an early resumption, as sufficient business is not coming out to warrant starting up. Independent mills are adhering to the Steel Corporation's prices, and while some feel that any weakening of the market at the present time would have the effect of delaying the start of a buying movement, others express the opinion that prices will have to go down to lower levels to encourage a resumption of activity. Pressure by buyers toward lower prices appears to be directed principally to plates, but in spite of rumors of price shading some buyers who have canvassed the market thoroughly have been unable to secure a quotation below 2.65c. The only definite weakness that has developed in the market is in hard steel reinforcing bars, one mill shading the 2.35c. price that has prevailed recently. In structural work it is announced that the Federal Reserve Bank will go ahead with its new building in Cleveland early this year and this will require 6000 to 8000 tons of structural material. The Southern Railway is inquiring for 50 Mikado type and 10 Mountain type locomotives.

Cleveland warehouses quote steel bars at 3.30c. to 3.34c.; plates, 3.60c. to 3.64c. and structural material, 3.40c. to 3.44c.; No. 9 galvanized wire, 4.70c.; No. 9 annealed wire, 4c.; No. 28 black sheets, 5.75c. to 5.90c.; No. 28 galvanized, 7.25c.; No. 10 blue annealed, 5c.

Coke.—Small lot sales of Standard Connellsville foundry coke are reported at $7.25 to $7.50, although

some makes are to be had at lower prices. No contracts are being placed for the first half.

Bolts, Nuts and Rivets.—The demand for bolts and nuts continues light. Manufacturers are getting a fair volume of orders, but they are all for very small lots. It is claimed that stocks of jobbers and manufacturers outside of the automobile field are generally low. Prices are being maintained at the recent reduction, but inquiries have not developed of sufficient size to test the market. The Ford Motor Co. has withdrawn its inquiry for a round lot of bolts and nuts. There is little activity in the rivet market. Some consumers, however, are placing first quarter contracts at the prices recently established.

Old Material.—Scrap prices have further declined in small lot transactions between dealers. There is no demand from consumers, but dealers are buying some scrap to lay down, offering around $14 for the best quality of heavy melting steel, and $7 to $9 for machine shop turnings for yard stocks. Shipments of steel-making scrap to consumers have all been virtually shut off, but some blast furnaces are still taking turnings. While the market was active, a large tonnage of turnings for blast furnaces was sold and the demand and price for this grade has not been affected to the same extent as heavy melting steel. Consequently the spread of $9 a ton in prices between heavy melting steel and turnings that existed last September has been cut down to about $3 a ton.

Dealers quote delivered at consumers' yards in Cleveland and vicinity, as follows:

	Per Gross Ton
Heavy melting steel	$14.00 to $14.75
Steel rails, under 3 ft	17.00 to 17.50
Steel rails, rerolling	18.00 to 19.00
Iron rails	18.00 to 19.00
Iron car axles	35.00 to 36.00
Low phos. melting scrap	16.50 to 17.00
Cast borings	12.00 to 14.00
Machine shop turnings	9.00 to 9.50
Mixed borings and short turnings	10.00 to 12.00
Short turnings for blast furnaces	10.00 to 12.00
Compressed steel	9.75 to 10.25
Railroad wrought	16.00 to 16.50
Railroad malleable	19.00 to 19.50
Steel axle turnings	12.00 to 13.00
Light bundled sheet stampings	6.00 to 7.00
Drop forge flashings over 10 in	9.00 to 10.00
Drop forge flashings under 10 in	9.00 to 10.00
No. 1 cast	23.00 to 24.00
No. 1 busheling	10.00 to 11.00
Railroad grate bars	17.00 to 17.50
Stove plate	17.00 to 17.50
Cast iron car wheels	20.00 to 21.00
Pipes and flues	9.00 to 10.00

Chicago

CHICAGO, Jan. 4.

Although the New Year is still young, here and there are to be noted signs of a revival in business, but whether these indications merely mark a temporary reaction from the utter stagnation of the last few weeks of 1920 or point to a gradual recovery in industrial activity cannot yet be ascertained. Generally speaking, the market is still exceedingly dull, so quiet that there is little inducement for producers to make further concessions in prices. This is particularly true of steel plates, shapes, bars and sheets being firm on the industrial board basis. The most important recent price announcement comes from the Republic Iron & Steel Co., which has met the Steel Corporation quotations on wrought steel pipe. It is understood that the local maker has since done likewise. The Republic company has also marked down bar iron to 2.68c., Chicago mill, a cut of $11.40 under the lowest previously reported price. The quotation is $1 per ton less than the ruling price for mild steel bars, which is 2.35c., Pittsburgh, or 2.63c., Chicago.

Production continues to diminish in this section. The Inland Steel Co. has blown out one of its three blast furnaces, and is operating none of its open hearths or finishing mills except the sheet department, which will probably be shut down this week. About the middle of the month the company expects to resume the operation of at least some of its sheet mills, and probably one or two of the other finishing departments. The Wisconsin Steel Co. is operating two out of three blast furnaces and about 60 per cent of its finishing capacity. Other steel plants are also working on reduced schedules and all of the hard steel bar plants in the district remain idle. Of the Republic plants in this territory only the East Chicago mill is working, and it is operating at a low rate.

The Illinois Steel Co. continues to operate at about 87 per cent of capacity. Merchant iron output has been further reduced. The Zenith furnace, Duluth, blew out to-day. Of the furnaces represented by the leading pig iron merchant, four are in and six are out.

Wage adjustments are looked for, but since the Inland Steel Co. changed from three shifts to two shifts the only action taken was the elimination of overtime rates by one of the smaller steel companies. Heretofore wages were calculated on the basic eight-hour day with time and one-half for overtime. Now the rate of wages applies for the whole 10 or 12-hour shift.

The Chicago Union Station Co. has awarded 700 tons for the Van Buren Street viaduct to the Bethlehem Steel Bridge Corporation. According to late reports, 1000 tons for the Junior Orpheum Theater, Minneapolis, has not yet been definitely let. The Chicago, Milwaukee & St. Paul has let the fabrication of 145 tons for track elevation work at Howard Street, Chicago.

The recent sharp cut in cast iron pipe has brought out a few attractive inquiries. Detroit is asking for bids on 9000 tons.

Pig Iron.—The market has a more cheerful tone, not because much buying has developed, but because inquiries, though small, are more numerous and the passing of 1920 resulted in the withdrawal of some resale offerings. A resale lot of 500 tons of malleable was bought by a melter in a neighboring State at the close of the year at $30, base, Chicago. It is questionable whether buyers generally can now purchase iron on so low a basis. For the time being at least, the ruling range in prices is between $32 and $35, Chicago, for No. 2 Northern foundry. A Wisconsin foundry is in the market for 200 tons of No. 2 foundry for January delivery, and a Michigan melter wants 100 tons of higher silicon material for prompt shipment. An Illinois foundry is inquiring for 200 tons of foundry for first quarter delivery. The local melter which was reported last week as having bought 3000 tons of foundry and 500 tons of malleable later purchased 500 tons additional of the latter iron on about the same basis. This same consumer is expected to enter the market again for a considerable tonnage for February and March shipment. Little Southern foundry is moving in this territory, as it cannot compete with Northern prices. One of the smaller Southern furnaces, however, is now quoting $30 base, Birmingham, or $36.37 delivered Chicago, while another maker in the South is offering higher silicon iron at $32 base, furnace. A large producer of charcoal iron is quoting $40, furnace, for prompt and first half shipment, a reduction of $5 under previous furnace prices. Copper free low phosphorus in resale lots has been offered here at as low as $46, delivered, and one producer is reported to be willing to meet that price or to do even better. Foundry operations in this district are estimated at from 30 to 40 per cent of normal. Some melters have been able to increase their output somewhat of late. A local steel foundry, for example, has booked considerable motor truck work. Spot beehive foundry coke is now available at as low as $6, Connellsville, while contract coke of good quality is available at from $6.75 to $7.50. Local byproduct foundry coke has been reduced from $16 to $14, oven.

The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable and steel-making irons, including low phosphorus, which are f.o.b. furnace and do not include a switching charge averaging 70c. per ton.

Lake Superior charcoal, averaging sil. 1.50, 1921 delivery (producers' price, deliv. at Chicago)	$48.50
Lake Superior charcoal, prompt shipment (resale)	43.50
Northern coke, No. 1, sil. 2.25 to 2.75	$33.25 to 36.25
Northern coke foundry, No. 2, sil. 1.75 to 2.25	32.00 to 35.00
Northern high phos.	32.00 to 35.00
Southern coke, No. 1 foundry and No. 1 soft, sil. 2.75 to 3.25	39.67 to 41.67
Southern coke, No. 2 foundry, sil. 2.25 to 2.75	37.92 to 39.92
Southern foundry, sil. 1.75 to 2.25	36.67 to 38.67
Malleable, not over 2.25 sil.	32.50 to 35.50
Basic	32.00 to 35.00
Low phos. Eastern furnace (copper free)	46.00 to 48.00
Silvery, sil. 7 per cent	47.53 to 50.53

Bars.—The Republic Iron & Steel Co. announces a price of 2.68c., Chicago mill, on bar iron, effective Jan. 1. This is a reduction of $11.40 under the lowest previously reported price, 3.25c., Chicago. It is equivalent to 2.30c., Pittsburgh, or $1 a ton less than the present quotation on mild steel bars. There is little demand for any kind of bars. In Iowa and other neighboring states considerable highway work is in prospect which will mean some business in reinforcing bars, but few orders are expected from this source until spring. In the absence of buying, rail carbon steel bar mills in this section remain idle.

Mill prices are: Mild steel bars, 2.35c., Pittsburgh, taking a freight of 38c. per 100 lb.; common bar iron, 2.68c., Chicago; rail carbon, 2.60c. to 2.75c. mill, nominal.

Jobbers quote 3.48c. for steel bars out of warehouse. The warehouse quotation on cold rolled steel bars is 5.25c. for rounds and 5.75c. for flats, squares and hexagons, an extra of 15c. per 100 lb. applying to orders exceeding 1000 lb. and under 2000 lb. and an extra 35c. on orders up to 1000 lb. Jobbers quote hard and medium deformed steel bars at 3.48c. base.

Old Material.—With the expiration of contracts on Jan. 1, trading between dealers has practically disappeared and the market is even more quiet than heretofore. The demand for rolling mill grades is almost negligible and melting steel is not sought after. There is a little spot inquiry for cast grades, needed presumably to balance mixtures. Although prices are little more than nominal, they have undergone few changes, melting steel, rerolling rails and No. 1 cast being slightly weaker. The Chicago & Northwestern offers 5000 tons, including 1500 tons of rails, 2000 tons of rolling mill grades, 500 tons of cast scrap and remainder miscellaneous material.

	Per Gross Ton	
Iron rails	$24.00 to	$24.50
Relaying rails	40.00 to	45.00
Car wheels	21.00 to	22.00
Steel rails, rerolling	15.50 to	16.00
Steel rails, less than 3 ft.	17.00 to	17.50
Heavy melting steel	15.00 to	15.50
Frogs, switches and guards, cut apart	15.00 to	15.50
Shoveling steel	15.00 to	15.50
Low phos. heavy melting steel	18.50 to	19.00
Drop forge flashings	12.00 to	12.50
Per Net Ton		
Iron angles and splice bars	25.00 to	25.50
Steel angle bars	15.00 to	15.50
Iron arch bars and transoms	26.00 to	26.50
Iron car axles	32.50 to	33.00
Steel car axles	17.00 to	17.50
No. 1 busheling	13.50 to	14.00
No. 2 busheling	9.00 to	9.50
Cut forge	13.00 to	13.50
Pipes and flues	10.00 to	10.50
No. 1 railroad wrought	13.50 to	14.00
No. 2 railroad wrought	13.50 to	14.00
Steel knuckles and couplers	14.50 to	15.00
Coil springs	18.00 to	18.50
No. 1 cast	17.00 to	17.50
Low phos. punchings	15.50 to	16.00
Locomotive tires, smooth	11.50 to	12.50
Machine shop turnings	7.50 to	8.00
Cast borings	9.50 to	10.00
Stove plate	20.00 to	20.50
Grate bars	13.00 to	13.50
Brake shoes	11.00 to	11.50
Railroad malleable	14.50 to	15.00
Agricultural malleable	14.50 to	15.00
Country mixed	10.00 to	10.50

Philadelphia

PHILADELPHIA, Jan. 4.

In view of the generally accepted belief that very little railroad buying may be expected within the near future, it is noteworthy that the first sizable inquiry for steel to come into the market in the new year calls for 14,000 tons of plates, shapes and bars, besides axles and wheels, for 2500 box cars which may be built by the Lenoir Car Works for the Southern Railway. This inquiry, which has been given widespread distribution in the trade, is believed also to be an effort to test present prices.

The new year starts out wtih a slight increase in inquiry for steel products, but pig iron and other raw materials are exceedingly dull. An inquiry comes from the Pittsurgh district for 2000 tons of rerolling billets and slabs; a contract for 500 tons of forging bars for first quarter has been entered by an Eastern company, and an Eastern tube manufacturer has bought 500 tons of skelp. These are the high spots which give the first week of the new year a slightly better tone than has prevailed in the past several weeks.

Pig Iron.—About a 25 per cent operation is being maintained by Eastern blast furnaces. Several of these furnaces which are in blast are operating with the blast cut down so that their output of iron is considerably below capacity. This is being done to avoid, if possible, banking or blowing out. In addition to the furnaces which went out of blast in December, there will be others in January, and none of those which are out have any definite plans for blowing in again. The Robesonia stack, which met with an accident, will go out within a few days. The Bethlehem Steel Co. has only one of its Lebanon furnaces in blast and is shipping foundry iron from Bethlehem. Business in pig iron is at low ebb. One sales company in December did but little more than 10 per cent of a normal month's business. Some sales records were not so good. Among the sales of the past week was one lot of 1000 tons of iron to a Virginia pipe foundry by a Virginia furnace which had the iron piled in its yard. Other current sales are mostly carload lots for prompt shipment. There is no interest in contracts for forward shipment.

The following quotations are for iron delivered in consumers' yards in Philadelphia or vicinity, except those for low phosphorus iron, which are f.o.b. furnace:

East. Pa. No. 2 plain, 1.75 to 2.25	$33.54 to	$36.54
East. Pa. No. 2X, 2.25 to 2.75 sil.	34.79 to	37.79
Virginia No. 2 plain, 1.75 to 2.25 sil.	40.74 to	45.74
Virginia No. 2X, 2.25 to 2.75 sil.	42.00 to	46.99
Basic deliv. Eastern Pa.		33.86
Gray forge		36.40
Standard low phos. (f.o.b. furnace)		45.00
Malleable	37.00 to	39.00
Copper bearing low phos. (f.o.b. furnace)		40.00

Warehouse Business.—Several reductions in prices have been made by local warehouses, effective Jan. 1. We quote as follows:

Soft steel bars and small shapes, 3.70c.; iron bars (except bands), 4c.; round edge iron, 4.10c.; round edge steel, iron finish, 1½ in. x ½ in., 4.00c.; round edge steel, planished, 4.75c.; tank steel plates, ¼-in. and heavier, 4.00c.; tank steel plates, 3/16-in., 4.40c.; blue annealed steel sheets, No. 10 gage, 4.90c.; light black steel sheets, No. 28 gage, 5.95c.; galvanized sheets, No. 28 gage, 7.50c.; square twisted and deformed steel bars, 3.90c.; structural shapes, 3.80c.; diamond pattern plates, 6.00c.; spring steel, 6.50c.; round cold-rolled steel, 5.35c.; squares and hexagons, cold-rolled steel, 5.85c.; steel hoops, No. 13 gage and lighter, 5.50c.; steel bands, No. 12 gage to 3/16-in. inclusive, 4.65c.; iron bands, 5c.; rails, 3.70c.; tool steel, 16.00c.; Norway iron, 12.00c.; toe steel, 6.00c.

Bars.—The first sign of any renewed interest in steel bars came last week in requests for contracts from a few consumers. One contract for 500 tons of forging quality bars for delivery over first quarter was closed at 2.35c., Pittsburgh. Eastern makers of bar iron have reduced their prices to 3c., Pittsburgh, a drop of $10 a ton. The Lenoir Car Works is inquiring for 6000 tons of iron or steel bars.

Rivets.—Eastern makers have reduced prices on structural rivets from 4.50c. to 4.25c., Pittsburgh, and on boiler rivets from 4.60c. to 4.35c., Pittsburgh.

Old Material.—Prices on old material have remained almost stationary during the last two weeks. Dealers are having difficulty in accumulating stocks at the present low prices. We quote for delivery at consuming points in this district as follows:

No. 1 heavy melting steel	$14.50 to	$15.00
Steel rails, rerolling	18.00 to	19.00
No. 1 low phos., heavy 0.04 and under	23.50 to	24.00
Car wheels	25.00 to	26.00
No. 1 railroad wrought	20.00 to	21.00
No. 1 yard wrought	16.00 to	18.00
No. 1 forge fire	13.00 to	13.50
Bundled skeleton	13.00 to	13.50
No. 1 busheling	15.00 to	16.00
No. 2 busheling	11.00 to	12.00
Turnings (short shoveling grade for blast furnace use)	13.00 to	13.50
Mixed borings and turnings (for blast furnace use)	12.00 to	12.50
Machine-shop turnings (for rolling mill and steel works use)	13.00 to	13.50
Heavy axle turnings (or equivalent)	14.50 to	15.00
Cast borings (for rolling mills)	15.00 to	16.00
Cast borings (for chemical plants)	17.50 to	18.00
No. 1 cast	22.50 to	23.00
Railroad grate bars	17.00 to	18.00
Stove plate (for steel plant use)	17.00 to	18.00
Railroad malleable	16.00 to	17.00
Wrought iron and soft steel pipes and tubes (new specifications)	14.00 to	15.00
Iron car axles	30.00 to	31.00
Steel car axles	25.00 to	26.00

Non-Ferrous Metals

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York		Tin	Lead		Zinc	
Dec.	Lake	Electrolytic	New York	New York	St. Louis	New York	St. Louis
29	13.75	13.25	34.00	4.75	4.75	6.20	5.70
30	13.75	13.00	35.00	4.75	4.75	6.20	5.70
31	13.75	13.00	35.00	4.75	4.75	6.10	5.60
Jan.							
3	13.75	12.75	35.00	4.75	4.75	6.10	5.60
4	13.75	12.75	36.00	4.75	4.75	6.10	5.60

NEW YORK, Jan. 4.

The tin and lead markets are more optimistic in trend than copper or zinc. In the latter the new year commenced with almost no demand. There has been considerable inquiry and business in lead and more interest in tin.

New York

Copper.—The new year starts out with no improvement in business or sentiment. Values are indeed lower. Last week it develops that a cash sale was made of electrolytic copper at 12.50c., producer's plant, the money to be paid before shipment. There was also a sale for forward delivery at 12.75c. While there is almost no inquiry or business the market may be quoted at 12.75c. to 13c., delivered or New York, for electrolytic copper, with Lake largely nominal at 13.75c. Estimated data as to production show 1,573,000,000 lb. of refined copper from all sources in 1920, against 1,768,000,000 lb. in 1919. Apparent consumption last year was 910,000,000 lb. against 877,000,000 lb. in 1919, with stocks on hand Dec. 31 at 874,000,000 against 904,000,000 a year ago.

Copper Averages.—The average price for Lake copper for the month of December, based on daily quotations in THE IRON AGE, was 13.88c. The average price for electrolytic was 13.63c.

Tin.—The tone has decidedly improved and more optimism prevails than in some time. The worst is believed to have passed with the old year. Dealers have been more interested the past week though consumers are still hesitant. There were no sales on the New York Metal Exchange but about 200 to 300 tons for shipment from London and from the East was sold at £214 to £221 per ton for the former and £2 to £3 per ton higher for the latter, which were mostly January-February shipments. Spot Straits, New York, has been a little higher with the quotation to-day at 36c., New York. Deliveries into consumption in December were 2580 tons with 2856 tons in stocks and landing on Dec. 31. Total imports for 1920 are returned as 50,563 tons against 35,404 tons in 1919.

Lead.—The tone of the market has improved and may be conservatively characterized as downright firm. Independent sellers are no longer inclined to meet the price of the leading interest which remains at 4.75c., New York and St. Louis, but are asking 5c. higher. A fair inquiry is reported current and considerable tonnage has been placed, principally by the leading interest. It is the general opinion that the bottom of the market has been reached and passed. While independents are asking a higher price than the leading interest, quotations from both sources remain on the same level at 4.75c., St. Louis and New York, for early delivery.

Zinc.—This market thus far this year has been absolutely stagnant, practically no sales having been made. Because of a higher market in London there has been less likelihood of importations and this factor has been largely eliminated. In the domestic market prime Western has slightly declined from its level of about a week ago until to-day it is quoted at 5.60c., St. Louis, or 6.10c., New York, with almost no business moving. Metal for importation is available at around 5.85c., seaboard, but this is not sufficiently low to compete with the domestic metal at the large consuming points.

Antimony.—The market is without life with wholesale lots for early delivery quoted at 5.20c., New York, duty paid.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is quoted by the leading interest at 28.30c., f.o.b. producer's plant, in wholesale lots for early delivery, while in the outside market the same grade is obtainable at 22c. to 23c., New York.

Old Metals.—Business is at a standstill and values practically unchanged. Dealers' selling prices are nominally as follows:

	Cents Per Lb.
Copper, heavy and crucible	12.75
Copper, heavy and wire	12.00
Copper, light and bottoms	10.25
Brass, heavy	9.25
Brass, light	6.75
Heavy machine composition	12.50
No. 1 yellow rod brass turnings	7.50
No. 1 red brass or composition turnings	10.50
Lead, heavy	4.00
Lead, tea	3.00
Zinc	3.25

Chicago

Jan. 4.—The opening of the new year has brought out some inquiries but, as yet, little buying. Lake copper remains stationary at 14.50c., but electrolytic is commonly quoted at 13.50c. and unverified sales at 12.50c. are reported. In general the market has a firmer tone, tin and lead having stiffened a little, the generally quoted prices being slightly higher than a week ago. There have been no changes in old metal prices. We quote Lake copper at 13.50c. in carload lots; tin, 36c. to 37c.; lead, 4.80c.; spelter, 5.75c.; antimony, 7c. to 7.50c. On old metal we quote copper wires, crucible shapes, 9c.; copper clips, 9c.; copper bottoms, 7.50c.; red brass, 9c.; yellow brass, 6c.; lead pipe, 3c.; zinc, 3c.; pewter, No. 1, 16.50c.; tinfoil, 20c.; block tin, 25c.; all these being buying prices for less than carload lots.

St. Louis

JAN. 3.—The non-ferrous markets have been very quiet during the week with quotations for carlots at the close as follows: Lead, 4.65c.; spelter, 5.75c. In less than carlots the prices quoted were: Lead, 5.25c.; spelter, 6.25c. to 6.50c.; tin, 39c.; copper, 15.50c.; antimony, 8c. In the Joplin district ores were quiet and not any higher, with lead ore selling, basis 80 per cent, at $47.50 per ton; zinc blende, basis 60 per cent, $32.50 per ton, and calamine, basis 40 per cent, $25 to $28 per ton. On miscellaneous scrap metals we quote dealers' buying prices as follows: Light brass, 4.50c.; heavy yellow brass, 6.50c.; heavy red brass, 10c.; heavy copper and copper wire, 10c.; light copper, 9c.; pewter, 18c.; tinfoil, 25c.; lead, 4c.; zinc, 5c., tea lead, 3c.; aluminum, 12c.

Steel Corporation Buys Manganese Properties

Judge Gary has announced that the Steel Corporation has purchased the manganese properties in Brazil from which it has been receiving manganese for several years. The following statement was made:

After long negotiations we have purchased the Morro da Mina properties about 300 miles from Rio de Janeiro in the State of Minas Geraes, Brazil. This mine contains a very large tonnage of good manganese ore. We are very much pleased with the purchase, as it makes the Corporation independent concerning manganese ore, which is an essential in the manufacture of iron and steel. We have been receiving shipments from the Morro de Mina for several years.

The Berger Mfg. Co., Canton, Ohio, is erecting combination warehouse and factory buildings in Kansas City and South Boston, and a warehouse in connection with its factory in Philadelphia, and also recently completed warehouse and factory buildings in Minneapolis and St. Louis. It is announced that $500,000 is being spent in erecting these buildings.

Prices Finished Iron and Steel, f.o.b. Pittsburgh

Freight Rates

Freight rates from Pittsburgh on finished iron and steel products, in carload lots, to points named, per 100 lb., are as follows:

Philadelphia	$0.35	St. Paul	0.695
Baltimore	0.335	Omaha	0.815
New York	0.38	Omaha (pipe)	0.78
Boston	0.415	Denver	1.35
Buffalo	0.295	Denver (wire products)	1.415
Cleveland	0.24	Pacific Coast	1.665
Cincinnati	0.33	Pacific Coast, ship plates	1.335
Indianapolis	0.345	Birmingham	0.765
Chicago	0.38	Jacksonville, all rail	0.555
St. Louis	0.475	Jacksonville, rail and water	0.46
Kansas City	0.815	New Orleans	0.515
Kansas City (pipe)	0.78		

The minimum carload to most of the foregoing points is 36,000 lb. To Denver the minimum loading is 40,000 lb., while to the Pacific Coast on all iron and steel products, except structural material, the minimum is 80,000 lb. On the latter item the rate applies to a minimum of 50,000 lb., and there is an extra charge of 9c. per 100 lb. on carloads of a minimum of 40,000 lb. On shipments of wrought iron and steel pipe to Kansas City, St. Paul, Omaha and Denver, the minimum carload is 46,000 lb. On iron and steel items not noted above the rates vary somewhat and are given in detail in the regular railroad tariffs.

Rates from Atlantic Coast ports (i.e. New York, Philadelphia and Baltimore), to Pacific Coast ports of call on all steamship lines via the Panama Canal are as follows: Pig iron, 55c.; ship plates 70c., ingots and muck bar, structural steel, tin plate, sheets, common wire products, 75c.; pipe not over 8 in. in diameter, 85c.; over 8 in. in diameter, 2½c. per inch, or fraction thereof additional.

Structural Material

I-beams, 3 to 15 in.; channels, 3 to 15 in., angles, 3 to 6 in., on one or both legs, ¼ in. thick and over, and zees, structural sizes, 2.45c.

Wire Products

Wire nails, $3.25 base per keg; galvanized, 1 in. and longer, including large-head barbed roofing nails, taking an advance over this price of $1.50 and shorter than 1 in., $2. Bright Bessemer and basic wire, $3.25 per 100 lb.; annealed fence wire, Nos. 6 to 9, $3.25; galvanized wire, $3.95; galvanized barbed wire, $4.10; galvanized fence staples, $4.20; painted barbed wire, $3.40; polished fence staples, $3.50; cement-coated nails, per count keg, $2.85; these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to point of delivery, terms 60 days, net, less 2 per cent off for cash in 10 days. Discounts on woven-wire fencing are 58 to 60½ per cent off list for carload lots, 57 per cent for 1000-rod lots, and 56 per cent for small lots, f.o.b. Pittsburgh.

Bolts, Nuts and Rivets

Large structural and ship rivets.....$4.25
Large boiler rivets.....4.35
Small rivets.....60 per cent off list
Small machine bolts, rolled threads.....60 per cent off list
Same sizes in cut threads.....50 and 10 per cent off list
Longer and larger sizes of machine bolts
45 and 5 per cent off list
Carriage bolts, ⅜-in. x 6-in.:
Smaller and shorter, rolled threads
40, 10 and 5 per cent off list
Cut threads.....40 and 5 per cent off list
Longer and larger sizes.....40 and 5 per cent off list
Lag bolts.....50 per cent off list
Plow bolts Nos. 1, 2 and 3 head.....50 and 5 per cent off list
Other style heads.....20 per cent extra
Machine bolts, c.p.c. and t. nuts ⅜-in. x 4-in.:
Smaller and shorter.....40, 10 and 5 per cent off list
Longer and larger sizes.....40 per cent off list
Cold punched and hot pressed sq. or hex. blank nuts
$2.25 off list
Tapped nuts.....$1.75 off list
C. p. c. & t. sq. or hex. nuts, blank.....list
C. p. c. & t. sq. or hex. nuts, tapped.....list plus $1.00
Semi-finished hex. nuts, U. S. S. and S. A. E.:
¼ to 9/16-in. inclusive.70 and 10 to 75 and 10 per cent off list
⅝ to 1 in. inclusive.....65 to 70 per cent off list
Stove bolts in packages.....75 and 10 per cent off list
Stove bolts in bulk.....75 and 2½ per cent off list
Tire bolts.....50 per cent off list
Track bolts.....5.50c. base
Sq. and hex. head cap screws, both rolled and cut threads:
Milled.....50 per cent off list
Upset.....55 and 10 per cent off list
Set screws:
Milled.....55 per cent off list
Upset.....60 and 5 per cent off list

One cent per lb. extra for less than 200 kegs. Rivets in 100-lb. kegs 25c. extra to buyers not under contract; small and miscellaneous lots less than two tons, 25c. extra; less than 100 lb. of a size, or broken kegs, 50c. extra.

All prices carry standard extras f.o.b. Pittsburgh.

Wire Rods

No. 5 common basic or Bessemer rods to domestic consumers, $57; chain rods, $57; screw stock rods, $62; rivet and bolt rods and other rods of that character, $57; high carbon rods, $68 to $75, depending on carbons.

Railroad Spikes and Track Bolts

Railroad spikes, 9/16-in. and larger, $3.65 per 100 lb in lots of 200 kegs of 200 lb. each or more; spikes, ½-in., ⅝-in. and 7/16-in., $4.50; 5/16-in., $5.25. Boat and barge spikes, $4.50 per 100 lb. in carload lots of 200 kegs or more, f.o.b. Pittsburgh. Track bolts, $5.50 base per keg of 200 lb. Tie plates, $3 to $3.60 per 100 lb.

Terne Plates

Prices of terne plates are as follows: 8-lb. coating, 200 lb., $13.80 per package; 8-lb. coating, I. C., $14.10; 12-lb. coating, I. C., $15.80; 15-lb. coating, I. C., $16.80; 20-lb. coating, I. C., $18 05; 25-lb. coating, I. C., $19.30; 30-lb. coating, I. C., $20.30; 35-lb. coating, I. C., $21.30; 40-lb. coating, I. C., $22.30 per package, all f.o.b. Pittsburgh, freight added to point of delivery.

Iron and Steel Bars

Steel bars at 2.35c. from mill. Common bar iron, 3.38c. to 3.50c.

Welded Pipe

The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

Butt Weld

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
⅛, ¼ and ⅜	50½	24	⅜	15½ to 16½	+10½ to 11½
½	54½	40	½	19½ to 20½	1½ to 2½
¾ to 3	57½	44	¾ to 1½	24½ to 25½	8½ to 9½

Lap Weld

2	50½	38	2	20½ to 21	6½ to 7
2½ to 6	53½	41	2½ to 6	22½ to 23	9½ to 10
7 to 12	50½	37	7 to 12	19½ to 20	6½ to 7
13 and 14	41				
15	38½				

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	46½	29	¼	+16 to 17	+49 to 50
½	51½	39	⅜	13½ to 14½	+2½ to 3½
¾ to 1½	55½	43	½	18½ to 19½	5½ to 6½
2 to 3	56½	44	¾ to 1½	24½ to 25½	9½ to 10½

Lap Weld, extra strong, plain ends

2	48½	37	2	21½ to 22½	8½ to 9
2½ to 4	51½	40	2½ to 4	23½ to 24	11½ to 12
4½ to 6	50½	39	4½ to 6	22½ to 23	10½ to 11
7 to 8	46½	33	7 to 8	14½ to 15	2½ to 3
9 to 12	41½	28	9 to 12	9½ to 10	+2 to 2½

To the large jobbing trade an additional 5 per cent is allowed over the above discounts, which are subject to the usual variations in weight of 5 per cent.

On butt and lap weld sizes of black iron pipe, discounts for less than carload lots to jobbers have been seven (7) points lower (higher price) than carload lots and on butt and lap weld galvanized iron pipe have been nine (9) points lower (higher price).

Boiler Tubes

The following are the prices for carload lots f.o.b. Pittsburgh:

Lap Welded Steel		*Charcoal Iron*	
1¾ to 2 in.	19½	1½ to 1¾ in.	+ 23
2¼ in.	24	1⅝ to 1⅞ in.	+ 20
2½ to 3¼ in.	30½	2 in.	+ 10 to 15
3½ to 4½ in.	40½	2¼ in.	+ 10 to 12
		2½ in.	+ 1 to 10
		2¾ to 3¼ in.	— 1½ to + 3
		3½ to 4½ in.	— 8

Standard Commercial Seamless—Cold Drawn or Hot Rolled

Per Net Ton		Per Net Ton	
1 in.	$327	1¾ in.	$207
1¼ in.	267	2 to 2½ in.	177
1⅝ in.	257	2⅝ and 3¾ in.	167
1½ in.	207	4 in.	187
		4½ to 5 in.	207

These prices do not apply to special specifications for locomotive tubes nor to special specifications for tubes for the Navy Department which will be subject to special negotiations.

Sheets

Prices for mill shipments on sheets of standard gage in carloads, f.o.b. Pittsburgh, follow:

Blue Annealed

	Cents Per Lb.		Cents Per Lb.
No. 8 and heavier	3.45	Nos. 13 and 14	3.65
Nos. 9 and 10 (base)	3.55	Nos. 15 and 16	3.75
Nos. 11 and 12	3.60		

Box Annealed, One Pass Cold Rolled

	Cents Per Lb.		Cents Per Lb.
Nos. 17 to 21	4.15	No. 28 (base)	4.35
Nos. 22 to 24	4.20	No. 29	4.45
Nos. 25 and 26	4.25	No. 30	4.55
No. 27	4.30		

Galvanized Black Sheet Gage

	Cents Per Lb.		Cents Per Lb.
Nos. 10 and 11	4.70	Nos. 25 and 26	5.40
Nos. 12 to 14	4.80	No. 27	5.55
Nos. 15 and 16	4.95	No. 28 (base)	5.70
Nos. 17 to 21	5.10	No. 29	5.95
Nos. 22 to 24	5.25	No. 30	6.20

Tin-Mill Black Plate

	Cents Per Lb.		Cents Per Lb.
Nos. 15 and 16	4.15	No. 28 (base)	4.35
Nos. 17 to 21	4.20	No. 29	4.40
Nos. 22 to 24	4.25	No. 30	4.40
Nos. 25 to 27	4.30	Nos. 30½ and 31	4.45

PERSONAL

John C. Jay, Jr., formerly general sales manager Pennsylvania Steel Co. and for the past four years member of the firm of George W. Goethals & Co., consulting engineers, New York, became a partner in the banking house of J. W. Seligman & Co., 54 Wall Street, New York, on Jan. 1. Mr. Jay continues as a director of George W. Goethals & Co.

H. H. d'Arcambal, chief metallurgist Pratt & Whitney Co., Hartford, Conn., gave an address on the "Hardening of High Speed Steel" before the Providence chapter of the American Steel Treaters' Society, on Wednesday evening, Dec. 29.

The Goulds Mfg. Co., Seneca Falls, N. Y., manufacturer of Gould pumps, announces the appointment of Edward S. Jenison as acting general sales manager to succeed W. E. Dickey who retired from business Jan. 1. For the past five years Mr. Jenison has been manager of the Philadelphia office.

Dr. Homer Gage has been made president of the Crompton & Knowles Loom Works, Worcester, Mass., to succeed the late Lucius J. Knowles. Dr. Gage has been a director of the corporation for many years and active in its affairs. Frank Edward Colesworthy, assistant purchasing agent since February, 1917, has been made purchasing agent to succeed the late Thomas C. Booth.

Isaac M. Scott, president Wheeling Steel Corporation, has been elected a member of the board of directors of the First National Bank, Pittsburgh.

Lester F. Moore, bridge engineer Massachusetts Public Utilities Commission, delivered an address on bridge construction before the Providence Engineering Society, on Tuesday evening, Dec. 28.

W. P. Holcombe has been appointed purchasing agent of the Brooklyn Edison Co., Brooklyn, N. Y.

The Stanley Works have established an office in Atlanta, Ga., with R. M. Parsons in direct charge. He was formerly manager of the New York office of the Stanley Rule & Level Co., which is now combined with the Stanley Works. He will be assisted by Mr. Hutchinson, who has traveled in this territory in the interests of the Stanley Works. Both Mr. Parsons and Mr. Hutchinson will, after Jan. 1, be located in Atlanta, Ga., and will represent the Stanley Rule & Level plant and the Stanley Works exclusively.

Frank Burns, formerly with the Morse Twist Drill & Machine Co., New Bedford, Mass., has been made superintendent of the Blancke Twist Drill & Tool Co., Taunton, Mass. He succeeds E. H. Fulton, who resigns owing to sickness in his family. A. E. Erb, assistant to L. C. Blancke, who formerly made his headquarters at Taunton, is now located at 10-12 Thomas Street, New York. Lloyd W. Pratt, formerly with the New Process Twist Drill Co., Taunton, is now general manager of the Blancke company.

The Cutler-Hammer Mfg. Co., Milwaukee, has secured offices in Suite No. 2111, Railway Exchange Building, St. Louis. This is a branch of the Chicago district office. Harold Phillips, formerly of the engineering department of Chicago, and later office manager of the Chicago office, will be in charge of the new St. Louis branch.

J. C. H. Van Duijl, Jr., J. C. H. Duijl & Zoon, Rotterdam, Holland, Dutch agents for the Norton Co., Worcester, Mass., who has been studying manufacturing processes at the Norton Co.'s Greendale plant for the past year, has returned home.

Arthur R. Adelberg, district manager of the Dayton, Ohio, branch of the Cyclops Steel Co., New York, has been transferred to the New York office, Fred J. Holden taking over the Dayton branch. The change became effective Jan. 1.

John S. Lemley, for five years general sales agent, G. F. Cotter Supply Co., Houston, Tex., and later with Wm. D. Jenkins, railroad supplies, St. Louis, Mo., and Dallas, Tex., has been appointed southwestern sales representative for Harry Vissering & Co. and the Okadee Co., Chicago, and Benton Harbor, Mich., manufacturers of railroad specialties for locomotives and cars, and for the Charles R. Long, Jr., Co., manufacturer of railroad paints, Chicago and Louisville.

R. R. Abbott, Peerless Motor Car Co., Cleveland, will address the Cleveland section of the American Society of Mechanical Engineers in the rooms of the Cleveland Engineering Society on Feb. 1 on "Uses of Alloy Steel in the Machine Tool Industries."

Harry G. Brown, superintendent at Alverton, and other works of the H. C. Frick Coke Co., has been appointed superintendent at the Davidson plant of the company to succeed H. E. Mason. Mr. Mason was promoted to the Frick superintendency at Leisenring to succeed Charles B. Franks, who resigned after 21 years with the Frick company to devote his time to his own coal and coke interests. Mr. Franks was guest of honor this week at a banquet tendered by Leisenring employees. Toasts were given by W. H. Glasgow, general superintendent of Frick plants, and W. C. Hood, assistant superintendent.

D. O. Thomas has been appointed plant manager of the Saginaw Malleable Iron Co., Saginaw, Mich., which is part of the Saginaw Products Co., a division of the General Motors Corporation.

A. R. Johnson, formerly of the Cadillac Motor Car Co., Detroit, has been appointed assistant sales manager of the Auburn Automobile Co., Auburn, Ind.

A. F. Ennis, who has had charge of the steel department of the Muncie Machinery & Supply Co., will join the sales force of the National Sales & Trading Co., steel department, at the main office, Racine Building, Cleveland, on Jan. 3.

American participation in the International Chamber of Commerce became fully organized Jan. 3 with the appointment of an American Committee composed of 57 of the leading business men of the country. Members of the committee were appointed by Joseph H. Defrees, president of the Chamber of Commerce of the United States. The metal industries are represented by E. A. S. Clarke, president Consolidated Steel Corporation, New York; Charles M. Schwab, chairman board of directors, Bethlehem Steel Corporation, New York; E. P. Thomas, president United States Steel Products Co., New York; and George P. Blow, president Western Clock Co., LaSalle, Ill.

John W. Bass is president of the Atlas Iron & Steel Co., Detroit, recently organized to take over the property and business of the Atlas Iron Works. The capital stock of the new company is $200,000.

The Cincinnati Engineers' Club elected the following officers for the coming year at their annual meeting: President, Francis R. Healy; vice-president, W. P. Fosdick; secretary-treasurer, E. A. Gast. A plan to consolidate all the engineering societies of the city was discussed at the meeting, and will be taken up further during the winter months.

N. J. Ross, for nearly 50 years associated with the Beloit Iron Works, Beloit, Wis., as treasurer, resigned Jan. 1 and will retire. E. H. Neese, vice-president, has been elected treasurer in addition to his other position. Alonzo Aldrich continues as president, and Hamilton Ross as secretary. Mr. Ross retains an interest in the corporation, which was established in 1885 as the Merrill & Houston Iron Works. It is one of the largest manufacturers of paper and pulp mill machinery in the world.

Calvin W. Verity, son of George W. Verity, president American Rolling Mill Co., Middletown, Ohio, has been elected treasurer of the company, the appointment to go into effect May 1, 1921. Mr. Verity has been in the employ of the company for 16 years, during which he has been in every department of the company, and is thoroughly conversant with the mechanical and business side of the organization. Mr. Verity is a graduate of Cornell University, and during the war was a captain in the Officers Reserve Corps at Frankfort Arsenal, Philadelphia.

OBITUARY

Julius S. Lane

JULIUS S. LANE, for many years engaged in the manufacture of mining machinery in the Central West, died at Locust Glenn, Conn., on Nov. 29. He was born on Nov. 17, 1841, at Akron, Ohio, and his father was one of the founders of that city. His boyhood days were spent there, and while a student in high school he built what was probably the first gas works in Ohio. A friend loaned him an English book describing the manufacture of coal gas, and he put in a system for lighting the old family house and a neighbor's house. These two houses were piped with lead pipe, he and a friend doing all the work. The gas holder was about 8 ft. in diameter and 8 ft. high, and set in a tank in the back yard. The gas works consisted of a small cast iron retort into which 50 or 60 lb. of soft coal from a local mine was put and distilled off by burning the coke from the previous charge under it. There was a small scrubber and lime tower for cleaning the gas, and it was only necessary to run the gas works once a week to make sufficient gas to light the two houses for an entire week.

Shortly before the Civil War young Lane went to Mount Vernon, Ohio, to learn the machinist's trade. Returning to Akron, a few years later, he held several positions, being one time superintendent for Taplin, Rice & Co. In 1867 he went to Ishpeming, Mich., to put in a large plant of mining machinery at the Lake Superior mine. As master mechanic of this mine, he made a good many innovations in what was then considered the best practice in iron mining equipment.

In 1868 he was offered a partnership at Akron and went back to join two others in the Webster, Camp & Lane Machine Co. Before going north he had patented some clay-making machinery, including a mill for the preparation of clay for making sewer pipe, pottery, etc. Much of the work of the Webster, Camp & Lane Co. for the first few years consisted of clay-working machinery and machinery for nearby coal mines. It also made equipment for the Schumacher oatmeal mills and for the B. F. Goodrich Co.

About 1876 Mr. Lane invented the Lane band friction hoist as applied to mining machinery, and these hoists were sent all over the world. In 1884 he became general manager of the M. C. Bullock Co., Chicago, manufacturer of mining machinery. Prior to that change he had made an extensive European trip, studying mining machinery. In 1893 he left this company and subsequently did a good deal of work in rearranging shops and in special consulting work. For a year or two he was connected with interests operating in Africa, and he was in Johannesburg at the time that John Hays Hammond and the others were tried for the conspiracy in the Jameson raid. Returning to England, he built some machinery for South Africa, but on account of the engineers' strike there he brought the work to the United States and completed it at the plant of the C. & G. Cooper Co., at Mount Vernon, Ohio. Thereafter he did consulting work.

Mr. Lane had been a member of the American Institute of Mining Engineers since 1880, and joined the American Society of Mechanical Engineers in 1882. He was always ready to help any man who came to him with a problem. He probably turned out as many apprentices who have made a place for themselves in the world as any other man in the country. Among those who had their training with him were the late Albert J. Pitkin, for some years president of the American Locomotive Co.; Arthur M. Lane, who is now connected with the same company at Schenectady; Arthur White, for many years in charge of the Manchester Locomotive Works; S. H. Pitkin, of the Wellman-Seaver-Morgan Co., and J. W. Stratton, chief enegineer.

For the past few years he was consulting engineer for the Engineer Co., New York, manufacturer of balanced draft equipment, and he had an office at 17 Battery Place. In August of this year he went to his daughter's farm in Connecticut for a short stay and while there had a fall, breaking a hip and collar bone. He had practically recovered from these injuries and was getting about once more, planning to return to his office in the city, when on Monday morning, Nov. 29, he was taken with a cerebral hemorrhage and died within a few hours.

Mr. Lane leaves his wife, Julia E. Lane, four sons and a daughter. His younger daughter died while he was in the hospital at Danbury. The oldest son is Henry M. Lane, of the H. M. Lane Co., Detroit.

WALTER H. WRIGHT, JR., president Wright Mfg. Co., manufacturer of pistons for automobile and tractor engines, and the Piston Foundries, Inc., both of Minneapolis, died in that city on Dec. 22, at the age of 42.

CHARLES F. MEYER, night superintendent General Steel Co., Milwaukee, died while on duty on Dec. 20, at the age of 60 years.

WILFRED C. SLY, president W. W. Sly Mfg. Co., Cleveland, manufacturer of foundry equipment, and GEORGE K. FANNER, superintendent of that company, were shot to death by bandits Dec. 31, while driving from a bank to their plant with money to meet their company's payroll. Mr. Sly was the son of W. W. Sly, who organized the company under its present name in 1903, having carried on the business under a partnership arrangement from 1874 until that date. W. C. Sly had been president of the company since the death of his father about nine years ago. He was 58 years of age. He was director of the Industrial Association of Cleveland and very active in the affairs of that association. Mr. Fanner, who was the son of George J. Fanner, vice-president of the Sly company, had been superintendent of the plant for about 10 years and was 34 years of age.

FERDINAND SCHLESINGER, for 30 years a leading figure in Milwaukee business life, died suddenly on a train at Albuquerque, N. M., Jan. 3, aged 70 years. He was executive committee chairman of the Steel & Tube Co. of America and the Milwaukee Coke & Gas Co. and had extensive interests in Lake Superior iron mines and in the manufacture of chemicals. He first came into prominence in Lake Superior iron mining in connection with the famous Chapin mine on the Menominee range, a lease he held being surrendered in the business depression of the eighteen-nineties. He had dealings also with Corrigan, McKinney & Co., involving properties in the Negaunee district and later in connection with that company acquired and operated silver mines in Mexico. His re-entry into the iron trade was as an important holder in the Northwestern Iron Co., which had two blast furnaces at Mayville, Wis. These and the company's iron mines were acquired by the Steel & Tube Co. of America in 1919. Mr. Schlesinger's interests took a wide range, one enterprise being a railroad to open up new Lake Superior iron properties.

PAUL L. WOELFEL, Pittsburgh, one of the country's foremost bridge construction engineers, died Dec. 28, in Philadelphia, after a long illness. He had been chief engineer of McClintic-Marshall Co., Pittsburgh, since 1908. Previously he had been connected with the Pencoyd Iron Works, Philadelphia, and continued with the American Bridge Co. when the latter took over the former, also in the capacity of chief engineer. The lock gates of the Panama Canal were constructed under Mr. Woelfel's supervision and he assisted in the designing and constructing of many large bridges in this country. He was a graduate of the University of Dresden and for a time was a professor of the University of Prague. He was a member of the American Society of Civil Engineers, the American Railway Engineering Association, the Society for the Promotion of Engineering Education and the Engineers' Society of Western Pennsylvania.

JOSEPH J. BLAUVELT, aged 69, representative of the New England Butt Co., Providence, R. I., died at his home in Providence, Dec. 28. Mr. Blauvelt was born and educated in New York and entered the New York district office of the New England Butt Co. at the age of 14 as an office assistant. He became connected with the main office of the company about 35 years ago.

A Specification for Cupola Semi-Steel

(*Continued from page* 10)

gradually being turned over to semi-steel specifications.

Comparative Tests

The three following tests were made by Evans, Diller and Dyer respectively:

No. 1	Per Cent Steel	Si	S	P	Mn	Total Carbon	Transverse Strength, Lb	Tensile Strength, Lb.
Gray iron	0	1.85	0.060	0.500	0.800	3.78	2,385	.....
Semi-steel	15.0	1.86	0.070	0.430	0.860	3.81	3,175	.....
No. 2								
Gray iron	0	1.76	0.062	0.488	0.530	3.63	2,440	22,180
Semi-steel	12.5	1.77	0.069	0.339	0.490	3.43	3,120	32,500
No. 3								
Gray iron	0	1.85	0.070	0.520	0.530	3.75	2,350	.....
Semi-steel	30.0	1.65	0.070	0.450	0.470	3.25	3,600	37,500

To the writer's mind, the poor showing of transverse strength in tests Nos. 1 and 2 is due to the high total carbon. This is borne out by the following tests made on shell mixtures:

Stark:	Per Cent Steel	Si	S	P	Mn	Total Carbon	Transverse Strength, Lb.	Impact
No. 1..35		1.33	0.121	0.194	0.45	3.20	3,300	22.5 in.
No. 2..35		1.35	0.121	0.208	0.45	3.20	3,400	24.0 in.
American Radiator Co.:								
No. 1..25.2		1.04	0.118	0.10	0.76	3.22	35,570	19.5 in.
No. 2..21.9		1.61	0.119	0.12	1.10	3.11	37,840	16.5 in.
No. 3..23.3		1.43	0.110	0.112	0.58	2.86	44,910	20.0 in.
No. 4..33.0		1.10	0.109	0.108	0.64	2.84	46,960	18.0 in.

The significance of these tests may be better grasped by the foundryman and purchasers of castings when it is borne in mind that ordinary cast iron will stand an impact test of only 13 to 14 in., while the Government specifications call for a minimum of 18 in.; also that ordinary gray iron rarely exceeds 3000 lb. transverse strength and 26,000 to 27,000 lb. tensile strength.

Scrap Prices Reached High and Low in 1920

(*Continued from page* 66)

scrap trade to believe that the liquidation in that market has been very thoroughly completed.

In past years when scrap prices dropped to a very low point there ensued a period of accumulation of stocks on the part of dealers. At present, however, the situation differs somewhat from past experience because of higher railroad freight rates and more costly labor. Before the war the average cost of preparing scrap for use in open-hearth steel plants, rolling mills or foundries was about $2 a ton; the pre-war freight rate from New England to eastern Pennsylvania was about $2.30. Thus there was a total cost of $5.30 to get steel scrap from New England into the yard of a steel plant in eastern Pennsylvania. To-day the labor cost is about $4.50 and the freight rate about $5 a ton. Under these circumstances the yard dealer is unable to offer more than about $5 a ton for heavy steel scrap, a price which does not tempt manufacturers who are paying a high price for finished steel to part with their stocks.

Scrap Production Decreases

Moreover, the general curtailment of industry in the past few months has greatly decreased the production of scrap, and this together with the fact that during and since the war the country has been consuming scrap at a very high rate makes it almost impossible for dealers to accumulate large stocks, as they have easily been able to do in past periods of depression and low prices.

When the steel plants resume full operation, they may be confronted with a scarcity of scrap. The great growth in open hearth steel making capacity in the past few years has increased the demand for scrap and the annual consumption in steel plants alone is estimated at about 10,000,000 tons annually. Add to this the quantities consumed by foundries, rolling mills, blast furnaces, electric furnaces, etc., and the total reaches 13,000,000 to 15,000,000 tons annually, according to the best obtainable statistics.

Another factor which contributed to large consumption of scrap in the past year was the higher cost of pig iron. In pre-war days the spread between steel scrap for open hearth use and basic pig iron approximated $1 to $1.50 per ton; during the past year, the spread varied from $5 to $25 per ton. Several steel plants which make their own pig iron found it profitable to increase the use of scrap in their open hearth furnaces, thus releasing basic iron for sale at a saving or profit of $10 to $20 per ton. During a considerable part of the year, the percentage of scrap used by all steel plants and foundries was greatly increased, as they had learned during the war period how to obtain good results with larger portions of scrap. Some foundries, for example, have used as high as 70 per cent scrap, while a few steel plants have utilized methods by which they can make plates, shapes and other finished products entirely from scrap.

Increased Demand for Turnings

One of the striking results of the war in the scrap trade has been the greatly increased demand from blast furnaces for turnings, cast iron borings or mixed borings and turnings. The explanation for this is that during the war practically all of the blast furnace operators learned the value of using this scrap, finding that its use quickened the output of the furnaces, with practically no expense for fuel. During the period of high-priced pig iron many furnaces used an extra percentage of borings and turnings so as to produce as much iron as possible prior to the termination of their high-priced contracts. This large consumption of borings and turnings continued for several weeks after production had fallen off, due to curtailed operations in machine shops, with the result that when the supply of other grades of scrap was far in excess of the demand there was still a shortage of borings and turnings. Many brokers and dealers voluntarily canceled contracts for borings and turnings through inability to obtain supplies.

The total output of borings and turnings has been somewhat reduced also through the fact that the high price of steel has caused machine shops to be more careful in ordering steel closer to finished sizes. Furthermore, the use of high-speed machine tools results in borings and turnings of lighter weight.

The automotive industry is a large producer of borings and turnings. In early October production in this industry almost ceased.

High Prices for Cast Scrap

The price of cast scrap soared to high figures during the past year, due largely to the scarcity of pig iron. Foundries were forced to increase the use of cast scrap to conserve pig iron stocks. Moreover, the use

Old Material Prices, Pittsburgh, 1920, Per Gross Ton

	Heavy Melting Steel	No. 1 Cast	Bundled Sheets	Borings	Turnings
January	$26.30	$32.00	$18.40	$18.70	$15.50
February	27.75	34.00	18.75	20.25	17.875
March	27.25	34.00	18.00	19.50	18.00
April	26.00	33.00	17.00	18.60	16.70
May	25.00	32.00	16.00	17.375	15.375
June	25.00	32.00	15.875	16.75	14.75
July	26.00	40.20	14.40	18.00	13.40
August	28.125	41.25	15.625	19.625	15.25
September	29.00	42.00	17.00	20.20	16.30
October	27.75	39.75	17.00	19.00	15.875
November	23.50	34.25	15.25	17.375	14.625
December	17.20	26.80	11.60	14.00	10.40

of cast scrap in open hearth furnaces has increased steadily in recent years. Some open hearth plants are also using stove plate. In some cases, cast iron borings have been substituted for cast scrap or stove plate in open hearth charges.

Decrease in Railroad Offerings

Railroads have not been scrapping a large quantity of material in the past few years, due to the fact that their old equipment is being repaired and put in shape for continued use. A careful canvass shows that the railroads of the country scrapped from 12 to 25 per cent less in tons during 1920 than in pre-war years. Under normal conditions, the railroads may be depended upon for about 25 per cent of all the scrap sold for commercial use in the United States.

At the time the increased freight rates went into effect in August, 1920, the price of heavy melting steel at Pittsburgh was $28 to $30 and in eastern Pennsylvania, $25. At these prices the higher rates made very little difference in the accumulation and distribution of scrap. Since the market has declined to the low values quoted in the final two weeks of 1920, the gathering of scrap practically stopped in those districts which have a high freight rate to points of consumption.

United States Exports Scrap to England

One of the surprising features of the 1920 scrap trade was the demand from England for steel-making scrap. In pre-war years this country has exported substantial quantities to Italy each year, but seldom, if ever, has England been a buyer here. During the war, England used up every available pound of scrap, so that the activity in her steel industry during the early part of 1920 forced her to look elsewhere for this material. The tonnages from France and Belgium were light and the quality of material poor, so that substantial orders, estimated at 120,000 tons, were placed in this country. The prices ranged from £10 to £11 c. i. f., netting the shipper here from $27 to $31 at Atlantic seaboard. The slump in British trade, which started in June, stopped this buying and a large number of orders were canceled.

Italy at present is practically bare of scrap. Normally she imports about 80 per cent of what she uses. The moment that steel manufacture is resumed there, Italy will again become a large buyer of American scrap. It is not likely that any large accumulations of scrap exist in Europe, for, like England, other European countries were thoroughly scoured during the war.

This country imports some scrap, probably about 75,000 tons a year, mostly from Canada. Our normal exports total about 200,000 tons annually. The steel industry, as heretofore stated, consumes about 10,000,000 tons annually, including the quantities which the steel companies themselves produce; blast furnaces take about 300,000 tons a year; iron rolling mills, 750,000 tons; rerolling mills, 100,000 tons; foundries, 1,000,000 tons, and about 300,000 tons are used in the manufacture of concrete bars. These, of course, are approximate figures, no accurate statistics having been collected, but they are based on facts regarding the use of scrap which were learned by the War Industries Board during the war.

Blast Furnace Plant Embodies New Features

(*Continued from page* 41)

water treating plant was furnished by William B. Scaife & Sons Co., Pittsburgh, and has a capacity of 750,000 gal. of water per day.

Electric power for the operation of the plant is purchased from the Madison County Light & Power Co. This is regularly furnished over a 13,200-volt line from McKinley Bridge station. As protection, a tap is brought in from the 33,000-volt lines of the same company, located nearby. Power from both of these lines is stepped down to 2300 volts at a sub-station located on the St. Louis Coke & Chemical Co.'s property. This substation is of the semi-outdoor type, the transformers and lighting arresters being located outside while the switching equipment is housed in a brick sub-station building of neat construction.

Each of the high voltage lines is equipped with a transformer bank made up of three 666 kva. 33000/13200/2200 volt transformers. All transformers are duplicates, the primary windings being arranged with taps for either primary voltage. The switching is so arranged that the 2200-volt bus may be cut over from one transformer bank to the other without delay. Power is distributed from this sub-station at 2300 volts to No. 1 substation—also to the by-products group in the coke department, and to the deep well pump house.

No. 1 sub-station is located centrally in the plant. It houses two 750-kw. motor generator sets comprising 750-kw. 250-volt direct current generators driven by 1060 hp. 80 per cent 2300 volt 900 r.p.m. self-starting synchronous motors. This station houses the necessary switching equipment for control of the sets, together with panels controlling alternating current 2300-volt distribution to the coal preparation and coke handling groups, and direct current 250-volt distribution to the car dumper, ore bridge, blast furnace and coke department groups. The constant running drives about the plant are handled by 220-volt induction motors. These are fed from transformer banks conveniently located. The car dumper, ore bridge, skip hoist, transfer cars and similar drives are equipped with direct current motors, on a full metallic system. The lighting is handled from a number of 10 kva. 2200/110 volt transformers connected to a 2200-volt lighting circuit.

Freyn, Brassert & Co., Chicago, designed and supervised the construction and equipment of the entire blast furnace plant. The contractors on the plant were John Mohr & Sons, Chicago, who erected the blast furnace, stoves, air and gas mains, and gas cleaning system; the American Bridge Co., Chicago, which erected the structural work consisting of the skip incline, furnace cast house, skip house, boiler house, power house, pig machine and ladle building. L. J. Mensch, Chicago, was concrete contractor on the boiler house and stove chimneys and also erected the reinforced concrete pig machine structure; Fruin & Colnon, St. Louis, were cement contractors for the bins and the stove, furnace, power house, and boiler house foundations. Much of this work, however, was also done by the St. Louis Coke & Chemical Co.'s organization.

The brickwork was installed by the P. J. Brown Construction Co., Cleveland; the piles, of which about 700 were used under the blast furnace foundations, are of the McArthur concrete type, having a loading of about 2800 lb. per sq. ft. The Pittsburgh Piping & Equipment Co., Pittsburgh, furnished and installed the water and steam piping; the H. W. Johns-Manville Co., Chicago, supplied the insulation of steam lines. The St. Louis Coke & Chemical Co.'s own organization performed much of the work in placing machinery. Fire brick for the furnace was furnished by the General Refractories Co.; for the stoves, by the Walsh Fire Brick Co.; for the boilers, by the Western Brick Co.

New Iron and Steel Works Construction

Open-Hearth Capacity Completed Last Year About 675,000 Tons—That Now Building Represents Only 430,000 Tons—Only One Blast Furnace Building

NEW open-hearth capacity completed and put into operation in the United States in 1920 was only slightly larger, so far as annual capacity was concerned, than that completed in 1919, but so far as the number of furnaces involved, there were more. Compared, of course, with the last three years of the war, the capacity completed last year and planned for this years is far below those records. New work initiated for 1921 is the smallest in many years, or only about 50 per cent of that under construction Jan. 1, 1920, and far below the record during the last three years of the war.

New Open-Hearth Capacity in 1920

In 1920 the new open-hearth capacity completed amounted to 675,000 gross tons. This compares with 625,000 tons added in 1919, with 1,945,000 tons added in 1918, with 4,326,500 tons in 1917 and with 4,205,000 tons in 1916. The summary below shows 20 open-hearth furnaces completed in 1920 as compared with 9 in 1919, with 46 in 1918, with 97 in 1917, and with 103 in 1916. The summary of the 1920 additions in the form of a table is as follows:

New Open-Hearth Furnaces Completed in 1920

	Number of Furnaces	Annual Capacity, Gross Tons
Independent companies	20	675,000
United States Steel Corporation	..	.....
Total	20	675,000

The additions to open-hearth capacity in 1920 were the folllowing: Weirton Steel Co., Weirton, W. Va., seven 100-ton furnaces; Lukens Steel Co., Coatesville, Pa., two 90-ton furnaces; Interstate Iron & Steel Co., Chicago, two 75-ton furnaces; Kansas City Bolt & Nut Co., Kansas City, Mo., two 50-ton furnaces; Naval Ordnance Factory, Charleston, W. Va., two 65-ton furnaces; Wayne Steel Co., Erie, Pa., two 25-ton furnaces; Judson Mfg. Co., San Francisco, Cal., one 30-ton furnace, and Black Steel & Wire Co., Kansas City, Mo., one 15-ton furnace.

The United States Steel Corporation made no additions to its open-hearth capacity at any of its plants last year, which is the first instance in some years. In 1919 it put into operation a third 100-ton open-hearth furnace at its Gary Works.

Open-Hearth Construction for 1921

Open-hearth furnaces under construction, most of which will probably be completed in 1921, number 15, which compares with 22 projected for 1920, with 16 under construction for 1919, with 35 for 1918, with 72 for 1917 and with 91 for 1916. The number projected for this year is the smallest in many years. The total estimated capacity of the furnaces projected for completion in 1921, which includes the new Bessemer plant of the Steel & Tube Co. of America, at Indiana Harbor, is 430,000 gross tons. This compares with 875,000 tons planned for 1920, with 1,130,000 tons planned for 1919, with 1,645,000 tons for 1918 and with 4,515,000 tons for 1917.

New installations contemplated for 1921 are as follows: Kansas City Bolt & Nut Co., Kansas City, Mo., three 50-ton furnaces, Mansfield Sheet & Tin Plate Co., Mansfield, Ohio, four 75-ton furnaces; Follansbee Bros. Co., four 40-ton furnaces, at the new plant at Toronto, Ohio; Naval Ordnance Factory, Charleston, W. Va., one 65-ton furnace; National Steel Foundries, Milwaukee, Wis., two 20-ton furnaces, and Black Steel & Wire Co., Kansas City, Mo., one 15-ton furnace.

The Steel & Tube Co. of America is installing a Bessemer steel plant consisting of two 15-ton converters and a 600-ton mixer at the company's plant at Indiana Harbor, Ind.

The United States Steel Corporation makes no mention in its report of any additions to its melting capacity in 1921.

Expressed in the table the proposed new open-hearth capacity is as follows:

New Open-Hearth Furnaces Under Construction for 1921

	Number of Furnaces	Annual Capacity, Gross Tons
Independent companies	15	430,000
United States Steel Corporation	..	.....
Total	15	*430,000

*Includes the Bessemer plant of the Steel & Tube Co. of America at Indiana Harbor, Ind.

New Blast Furnace Construction

The record of additions to pig iron making capacity in 1920 is larger than it was in 1919. In 1919 only two blast furnaces were completed and put into operation, but in 1920 six furnaces were completed, most of which are already in operation; in 1918 eight furnaces were completed and in 1917 there were 14. The record last year compares with that in 1916, when four furnaces were put in blast. Six furnaces completed in 1920 represented a capacity of 875,000 gross tons of pig iron.

For 1921 our statistics show that there is only one blast furnace under construction for probable completion this year. This is probably the smallest contemplated increase to the pig iron capacity of the company ever recorded. It represents an estimated new capacity of about 200,000 tons of pig iron per year. The following table gives details of new blast furnaces completed in 1920 and at present under construction.

Company	Completed in 1920	Under Construction or Projected
Trumbull Cliffs Furnace Co., Warren, Ohio	..	1
Ford Motor Co., Detroit, Mich.	2	..
St. Louis Coke & Chemical Co., Granite City, Ill.	1	..
Pittsburgh Crucible Steel Co., Midland, Pa.	1	..
Bethlehem Steel Corporation, Maryland plant	2	..
Total	6	1

Several companies rebuilt or enlarged their furnaces in 1920 or plan to do so this year. Prominent among these are the Wharton Steel Co., Wharton, N. J.; the Crane Iron Works, Catasauqua, Pa.; the Thomas Iron Co., Hokendauqua, Pa.; E. W. Mudge & Co., Claire furnace, Sharpesville, Pa.; the West furnace of American Rolling Co., Columbus, Ohio; Belfont Iron Works Co., Ironton, Ohio; E. & G. Brooke Co., Birdsboro, Pa., and Lavino Furnace Co., Sheridan, Pa.

The Steel Corporation

New construction completed during 1920 and that under way as of Jan. 1, 1921, by subsidiary manufacturing companies of United States Steel Corporation, is as follows:

Carnegie Steel Co.

Completed

Edgar Thomson Works: Additions to Blast Furnace C.

Duquesne Works: Rebuilding blast furnace No. 5 and additions to blast furnace No. 6.

Homestead Works: 125-ton pouring crane at open-hearth plant No. 2.

Carrie Furnaces: 15,000-k.w. turbogenerator complete with boilers and auxiliary facilities; gas washing equipment at blast furnace No. 5, and additions and replacements to blast furnaces Nos. 3, 4 and 6.

Ohio Works: Condenser for 40-in. blooming mill engine.
Mingo Works: New ore bridge.
New Castle Works: 3 new hot blast stoves at blast furnace No. 1.
Clairton Works: Concentrated ammonia plant; coal dock and coal storage facilities at Wilson station.
Farrell Works: Carpenter and pattern makers shop.

Under Way

Edgar Thomson Works: Reconstruction of stock yard bunker and larry system at blast furnaces and extending electric stock transfer system; additions to crane facilities in Nos. 2 and 3 foundries and foundry roll and machine shop; Greenawalt sintering plant No. 2 at briquetting plant.
Duquesne Works: Reconstruction of Blast Furnace No. 3 and stock yard; addition to inspection building at lower works.
Homestead Works: Six 125-ton pouring cranes at open-hearth plant No. 3; hydraulic pumps and pressure system at 32-in. slabbing mill to serve, 32, 72, 84 and 140-in. mills and open hearth plants Nos. 1 and 2; rebuilding two 5-hole banks of pit furnaces and installing transfer car at 32-in. slabbing mill; motor drive for 33-in. finishing mill.
Upper Union (Pittsburgh) Works: Crane runways and electric overhead traveling cranes for raw material stock yard.
Ohio Works: New boiler plant; reinforcing bin system at blast furnaces Nos. 1 to 4.
McDonald Mills: 18-in. band mill and 10-in. hoop mill.
Mingo Works: 3 new hot blast stoves at blast furnace No. 2.
Farrell Works: Reconstruction of blast furnace No. 2; rebuilding 3 open-hearth furnaces.
Clairton Works: Equipping 6 blooming mill boilers to burn coke breeze.

Illinois Steel Co.

Completed

South Works: 100-ton pouring crane at No. 1 open-hearth plant; 300-ft. building over finishing end, two heating furnaces, cooling, shearing and shipping facilities at 90-in. and 132-in. plate mills.
Gary Works: 10-in. hand operated merchant mill.

Under Way

South Works: Gas engine driven electric power station; 3 waste heat boilers at No. 3 duplexing open-hearth plant.
Joliet Works: Rebuilding 4 batteries of ovens at by-product coke plant.
Gary Works: 12-in. and 20-in. strip mills; enclosing billet and blooming mill chipping yards; enlarging coal storage yard and 3 coal unloading machines at by-product coke plant; 200-ft. extension to electrical repair shop and additional equipment.

Universal Portland Cement Co.

Under Way

Buffington, Ind.: Additional kiln unit in burner building at mill No. 6.
Universal, Pa.: Coal drying and pulverizing plant; dust collecting system on kiln stacks; dwelling houses and recreation center for employees.

Minnesota Steel Co.

Under Way

Duluth Plant: Rod and wire mill; additions to 28-in. rail mill; new roll shop and machine tool equipment; additional generating equipment in electric power station No. 2 and boilers in boiler plant No. 2; extending ore, coal and stone storage yard; townsite extension and additional dwellings for employees.

The Lorain Steel Co.

Under Way

Johnstown Works: Extensions to iron and steel foundries buildings; pattern storage building.

National Tube Co.

Completed

Lorain Works: Electrical equipment to permit operation with purchased power.
National Works: Rebuilding blast furnace No. 3.
Christy Park Works: "Horn" welding department for large sizes of pipe.
Continental Works: Coupling finishing equipment and rearrangement of coupling shop.
Riverside Works: Scale removing equipment for butt weld mills Nos. 1 to 5.
Ellwood Works: completing threading department at No. 5 hot mill; townsite and 100 houses for employees, including bridge over the Connoquenessing River.

Under Way

Lorain Works: 2 lap weld mills, additional coupling shop machinery and extension to machine shop.
National Works: Ore thawing house at blast furnaces; pumping equipment and remodeling settling basin at pumping plant; additional cutting-off and threading equipment at lap weld mills.
Pennsylvania Works: Coupling finishing equipment for manufacture of taper tapped couplings.
Ellwood Works: Equipment for forming automobile axles, torque tubes, etc.

American Steel & Wire Co.

Completed

Cuyahoga Works: Additions to Nos. 1 and 3 strip mills.
Waukegan Works: New patenting furnace building and furnace.
Donora Steel Works: 2 additional boilers in steam power plant.

Under Way

Newburgh Steel Works: New water cooling towers at reservoir.
Central Furnaces: Additions to slag crushing plant.
H. P. Works: New boiler plant.
Cuyahoga Works: Facilities for handling and storing hot rolled flats at Nos. 1 and 3 strip mills; patenting furnace and equipment for spring wire.
Waukegan Works: New boiler plant.
Braddock Works: 4 additional annealing furnaces.
Rankin Works: 20 double blow nail machines.
Worcester, North Works: Additional electro galvanizing equipment.
Worcester, South Works: Coal handling plant; standard gage track connection to lower yard.

American Sheet & Tin Plate Co.

Completed

Gary Works: 24 additional tin mills.
Vandergrift Works: Increasing handling facilities in open hearth department.
New Castle Works: Stoker equipment on 20 hot mill furnaces.
Dover Works: Additions to steam power plant.

Under Way

Gary Works: Motor drive for finishing stand at No. 2 plate mill.
Vandergrift Works: New pickling and galvanizing department buildings and equipment; new mill engines and drives; replacement of boilers and equipment at No. 1 boiler house.

American Bridge Co.

Completed

Trenton Works: New buildings and equipment to modernize plant.

Under Way

Pencoyd Works: Additional generating capacity for electric power.

Tennessee Coal, Iron & Railroad Co.

Completed

Ensley Works: Additions to blast furnace No. 3; increasing boiler capacity at blast furnace No. 1 steam plant; equipping open-hearth furnaces to burn tar as fuel.
Fairfield Works: Gantry crane and runway.
By-Product Coke Plant, Fairfield: 154 additional by-product coke ovens; enlarging benzol plant.

Under Way

Ensley Works: Dry gas cleaner for blast furnace No. 5.
Fairfield Works: Fabricating plant for ship and car material; addition to finishing end at bar and structural and plate mills.
Pratt Coal Mines: Opening and equipping No. 18 mine, Hamilton slope.

The Bethlehem Steel Corporation

The Bethlehem Steel Corporation and subsidiary companies report the following concerning construction completed in 1920, and now in progress:

Bethlehem Plant, Bethlehem, Pa.

Completed in 1920: A 42-in. shape mill; narrow gage tracks for structural shipping yard at Saucon plant; two electric traveling cranes; two heavy duty roll lathes for

merchant mills at Lehigh plant; 25 Clarke side-dump railroad cars; extension to warehouse of mill No. 2 at Lehigh plant and the buying of additional land for athletic field, besides minor improvements.

Under Way: Extension to 28-in. billet mill building, Saucon plant; shop for the manufacture of steel automobile wheels; ore and limestone bins and trestles for open-hearth No. 2 at Saucon plant; converting machine shop No. 5 to a fabricating shop for light sections; welfare building for armor plate department, and numerous other minor improvements.

Steelton Plant, Steelton, Pa.

Completed in 1920: Extension to rail and structural finishing mill and a few other improvements.

Under Way: Nine oil-burning drag furnaces; two overmotor drive for 44-in. mill; four gas producers for mill heating furnaces; crane runway for steam blowing engine building and other minor improvements.

Lebanon Plant, Lebanon, Pa.

Completed in 1920: Equipment of 8-in. central mill for rolling file steel; rebuilding 9-in. and 12-in. West mills; purchase of additional real estate; two-story brick building for central service department and other minor improvements.

Under Way: Nine oil-burning drag furnaces; two overfired heat-treating furnaces; new cooper shop and galvanizing department; wire drawing and pickling department; one 10,000 k.w. turbogenerator for power station and other minor improvements.

Maryland Plant, Sparrows Point, Md.

Completed in 1920: Two blast furnaces, 600 ton capacity, were completed and put in operation last summer. In addition there were added: Gas producer plant for open-hearth No. 2; additional crane facilities in billet and sheet bar storage yard of 40-in. blooming mill; 12 hot mills, 8 sheet mills and two jobbing mills at tin plate plant; and 60-in. universal plate mills, practically completed. There have been minor additions to buildings and equipment.

Under Way: Two hundred-foot extension to billet and sheet bar storage runway at 40-in. blooming mill; one additional 4-hole soaking pit furnace for 40-in. blooming mill; plate turnover device at 110-in. plate mill; extension to ore unloaders; coal crushers for gas producers of open-hearth No. 2, and for gas producers at 40-in. blooming mill and other minor improvements. There are also under construction 100 houses and 100 bungalow type dwellings.

Mining and Other Operations

In Cuba, the name of the Spanish American Iron Co. was changed to Bethlehem Cuba Iron Mines Co. on April 30, 1920. A railroad line from the road crossing on the Daiquiri railroad to the Juragua railroad, was completed last year. In the Mayari Division there was completed a coal drying and pulverizing equipment for the nodulizing plant.

At the Bethlehem Chile Iron Mines Co., Chile, a new ore crusher, including conveyors, is in progress of construction.

The Ore Steamship Corporation, last year completed one steel ore steamer of 11,500 dead weight tons, and now has under construction three steel combination ore and oil steamers and two steel combination ore and coal steamers of about 20,000 dead weight tons each.

For the company's Cornwall Railroad Co. there are 75 ore cars and 2 locomotives completed.

The corporation, on Oct. 1, 1920, acquired the business and plant of Redington Standard Fittings Co., which is now designated as Redington plant. This year, a Dahl oil burning system is being installed at the power house of this plant and the purchase of a 2000-lb. electric furnace and appurtenances.

In general, the corporation in the last year completed 1000 coal and ore cars, 70 ton, and 549 coal cars, 55 ton, and has under way two 6-wheel switching locomotives.

Midvale Steel & Ordnance Co.

The following work has been completed during the past year at the different plants of the Midvale Steel & Ordnance Co.:

Cambria Steel Co., Johnstown, Pa: Two tandem compound condensing steam engine blowers for blast furnaces Nos. 1 to 4; excavating channel for Hinckston run; two heavy type switching locomotives for general yard service; office building for railroad department; scull breaker for entire works located at Williams farm; hot metal charging crane for Franklin open-hearth department; relining Nos. 10 and 11 blast furnaces; gate house and police headquarters for Cambria Plant; 4000 h.p. modern boiler plant for electric power station; additional mine equipment for Slickville mines; charging crane for the slabbing mill furnaces; pickling shed and tanks for 13-in. mill; plant for the manufacture of rail anti-creepers: stockyard cranes for Franklin open-hearth department, and 42 houses for workmen at wheel plant.

Union Coal & Coke Co.: Concreting No. 1 shaft and additional mining machines for Marianna Mine; six electric gathering pumps for Marianna; seven houses at Bentleyville for mine officers.

Coatesville Works: Locomotive repair shop; relining of No. 2 blast furnace; the one 4-hole soaking pit furnace with gas producers at No. 4 mill; dam and spray system for water supply at Brandywine plant; electric crane and run-way at the viaduct forge department; ladle house for lining and skulling ladles, 368-ft. extension to ore yards, additional stand pipe, and pipe and blacksmith shop at blast furnaces; electric crane and run-way at pig machine shop.

Nicetown Works: Alterations in Nos. 2 and 3 machine shops for manufacture of large guns; rearrangement and table equipment for 15-in. mill; furnace and large dipping tank for bucket wheels; 14,000 gallon oil storage tank and 3-ton crane with run-way in casting plant; crane run-way and crane for ingot yard 15-in. mill.

The following work is now under construction: *Cambria Steel Co.:* Plant for sintering flue dust at blast furnaces Nos. 1 to 4; two dry gas cleaners for Nos. 5 and 6 blast furnaces; two ore bridges for Hinckston Run Ore yard; hot metal ladles, trucks and tilting rigs at pig casting plant, also changes at Bessemer plant; ore and limestone bin system with coke handling system for blast furnaces Nos. 7, 8, 9, 10 and 11; relining Nos. 1, 7 and 8 blast furnaces; 148 coke ovens complete with by-product and light oil recovering apparatus and by-product plant for present coke ovens, together with benzol plant for all coke ovens; three 12,000 gallon quenching tanks, together with circulating pumps for Franklin coke plant; 51 gas producers, entire new equipment of gas valves, ore and limestone bins and sewer system for Franklin open-hearth plant; entire replacement of soaking pit furnaces at Franklin 40-in. blooming mill; screw down pinions, spindles, etc., at 40-in. blooming mill; new motor drives for 8-in. No. 3 and 9-in. No. 1 merchant mills; plant for the manufacture of the henggi anti-rail creepers; 8000 h.p. modern boiler installation for Franklin plant; extension of car shop to increase output of standard cars and also for the manufacture of tank cars; completing the existing two units for the manufacture of rolled steel wheels; repair machine shop for electric department, including tools; coaling station for yard locomotives; railroad bridge over Pennsylvania railroad to reach dumping ground; coal well, dumping equipment for Elk Run, and necessary construction for the completion of Nos. 5 and 6 mines, as well as the electrification of rolling mill mine; extension to works' hospital; town site and 100 houses back of Westmont; two cars for Cambria incline plane.

Union Coal & Coke Co.: Electrifying Hazelkirk and Acme mines; opening of new shaft for Marianna mine; replacement of fan and hoist at Acme mine; replacement of fan and rotary dump and new mechanical screening arrangement for Acme mine; rotary dump for Hazelkirk mine No. 2.

Coatesville Works: 22-in. skelp mill for the tube plant; waste heat boilers for open-hearth department; concrete road between Coatesville and Modena.

Republic Iron & Steel Co.

New improvements and additions made by the Republic Iron & Steel Co. at its various plants during 1920, or still under construction, are as follows:

At the open-hearth works, Youngstown, Ohio, it has under construction a coal, coke and limestone storage yard for 100,000 tons of material, the yard being equipped with elevated trestles for dropping the material out of hopper bottom railroad cars and a gantry crane for handling to a storage pile and reloading; a boiler shop, locomotive washout, tube cleaning and welding shop for the care of the locomotives and locomotive cranes are also being built.

At the Haselton blast furnace plant, Youngstown, the installation of No. 3 turboblower for supplying air to blast furnaces Nos. 1 and 5 with the necessary extension to the blowing engine house and additional auxiliary equipment, was completed. Electric trucks for handling ore and coke buggies from the stock bins to the hoist, were installed. A thaw house, capable of holding twenty railroad cars and to be used for thawing coal and ore, is rapidly nearing completion.

At the by-product coke works, Youngstown, a disastrous fire occurred in June in the benzol building which necessitated extensive replacements. Boilers Nos. 4 and 5 are now being equipped with Coxe stokers.

At the tube works, Youngstown, a 40-ft. extension was made to the coupling shop and additional equipment installed for the making of large couplings. A 140-ft. exten-

sion to the shipping building and 20-ft. extension to the threading bay are now under construction. Bunk houses and commissary buildings for the accommodation of 200 men were built.

At the Niles Works, Niles, Ohio, a complete new sheet mill consisting of eight 30-in. sheet mills in two units of 4 mills each, with eight sheet and pair furnaces and six stands of 26-in. cold mills with six double annealing furnaces is rapidly nearing completion. The mills are all electric driven and the whole equipment is housed in one building of seven bays, each covered by electric cranes. The building is 466 ft. wide x 500 ft. long and built of steel, except the warehouse and shipping bay, which are built of brick. The hot mills have water cooled standings and an air cooling system. Transfer cars, 20-ton, are used between the hot mills and the warehouse. In addition to the mill, a copperas plant, machine shop, scrap bundling building, brick storage, grease house, pump house, water and sewage system, drinking water system and welfare building that serve both the new and old mills are being built at this time. The galvanizing department of the present sheet mill No. 1 has been remodeled and reconstructed and new equipment added so that it can handle the products of this mill and the new sheet mill. Between the warehouse of sheet mill No. 2 and the galvanizing department of sheet mill No. 1, a 50-ton transfer car is used. Two double box annealing furnaces were necessary to obtain the maximum production of the 10 mills in sheet mill No. 1 and these were added during the year.

At the Atlantic furnace, New Castle, Pa., a new single strand pig casting machine with the necessary accessories was installed and a new motor generator set has been purchased.

The extensions and alterations to the general offices of the company at Youngstown, were completed. There have been purchased 160 steel hopper cars to add to the rolling stock now in use between the company's mines and plants.

Weirton Steel Co.

The Weirton Steel Co., Weirton, W. Va., completed last year seven 100-ton open-hearth furnaces, four of which now are in operation and the other three of which will be put in operation as soon as business conditions justify. The capacity of these seven furnaces is approximately 500,000 tons of steel ingots per year. The company has also completed and put in operation last year one 40-in. blooming mill, one 21-in. continuous billet mill and one 18-in. continuous sheet bar mill. The rolling capacity of these mills is approximately 750,000 tons per year.

Inland Steel Co.

The Inland Steel Co., Chicago, with works at Indiana Harbor and Chicago Heights, last year completed equipment for rolling splice bars, or rail joints, on its 28-in. mill. The company's new powdered coal plant is progressing but will not be ready for operation until January or February.

The project of rolling rails which was contemplated a year ago has been abandoned. Including 40 coke cars now under construction, it will have 272 steel cars for use about its works early this year.

The sheared plate mill has been changed from a 90-in. to a 100-in. mill, and one stand of rails has been added. One will be roughing and the other will be finishing. This should increase the capacity of the mill from 50 to 100 per cent. The finishing bay for the company's 28-in. mill, 560 ft. by 90 ft., is nearly completed and will be ready early this year.

Pittsburgh Crucible Steel Co.

The Pittsburgh Crucible Steel Co. last year completed a new blast furnace with an annual rated capacity of 200,000 tons. Construction on this stack was begun June 2, 1918, and the work completed about the middle of last year. It went into blast on Oct. 9, 1920. There were no additions to the steel making or rolling capacity during the year, but the construction of a new by-product coke plant consisting of 100 Koppers ovens, the capacity of which is 435,000 net tons annually, was completed. The new blast furnace will make it unnecessary for the company to hereafter buy any pig iron; previously it had bought about one-third of its requirements. It also becomes self-contained in the matter of coke supplies as a result of the completion of the by-product plant. Another plant betterment of 1920 was the completion of unloading facilities on the Ohio River, upon which the plant of the company at Midland, Pa., is located. This improvement will relieve the company from entire dependence upon the railroads, as in the past, to furnish it with supplies of coal. The unloading facilities will enable the company to secure by river its fuel and coking coal from its own mines.

The Steel & Tube Co. of America

The Steel and Tube Co. of America completed and put into operation last year a lap weld pipe mill for making large pipe from 10 in. to 20 in. in diameter. It now has under construction at Indiana Harbor a Bessemer plant consisting of two 15-ton converters, a 600-ton mixer, waste heat boilers and electric power plant in connection therewith, as well as two butt weld pipe mills and a seamless tube mill.

At the company's South Chicago plant, which is the Iroquois Iron Co., there is being constructed a sintering plant.

The company has also installed at its Indiana plant a 24 in. billet mill of 2 stands, 3 high.

Interstate Iron & Steel Co.

The Interstate Iron & Steel Co., Chicago, placed in operation in 1920 two 75-ton basic open-hearth furnaces, oil fired.

A new 12-in. three-high continuous bar mill is in the process of construction and it is expected to be completed in February this year. It has 6 roughing stands and 6 finishing stands and is driven by electric motors. The capacity per 24 hours is 400 tons.

The company also has in construction 2 heating furnaces and 2 soaking pits and 4 gas producers.

Gulf States Steel Co.

The Gulf States Steel Co., Birmingham, Ala., last year erected a 20-in. three-high and three-stand bar mill, with heating furnaces, boilers, etc., having a capacity of 70 tons per day of 12 hours. The company has also increased its wire mill drawing capacity 50 per cent by the addition of two sets of 40 block wire drawing punches together with bakers and other equipment. The nail making capacity has been increased about 30 per cent by the addition of 30 nail machines.

The company now has under construction the installation of two 2500 kw. low pressure turbo-generating units for generating electricity used at its steel mill by the use of low pressure steam from the rod mill engines. This work is expected to be completed in March this year.

Jones & Laughlin Steel Co.

The Jones & Laughlin Steel Co., Pittsburgh, put in operation late last year a new 2 to 4-in., two-high lap weld tube mill for pipe. This is driven by an electric motor and has a capacity of 125 net tons per day. There was also constructed and completed last year a battery of 60 coke ovens of the Koppers regenerating type with a capacity of 650 tons.

The company has under construction a new 32-in., two-high plate mill driven by a reversing steam engine which has a capacity of 600 gross tons of steel plates per day. It is expected that this mill will be completed the first week of this year.

The Lukens Steel Co.

The Lukens Steel Co., Coatesville, Pa., last year constructed two 90-ton open-hearth furnaces which were built by the S. R. Smythe Co. At the end of last year these furnaces were practically complete and were equipped with Morgan continuous producers and with the necessary mechanical coal and ash handling equipment. If operated to their normal capacity they should produce 70,000 tons of ingots per year. The building of these furnaces is stated to have been undertaken at this time in order to provide the company

with the additional steel capacity necessary to operate its large 204-in. plate mill to advantage.

Kansas City Bolt & Nut Co.

The Kansas City Bolt & Nut Co., Kansas City, Mo., last year built a new open-hearth steel rolling mill. The open-hearth department has two furnaces of 50 tons capacity each complete and operating, and three furnaces partly finished. There will be five furnaces in the complete plant. The rolling mill will include a 22-in. finishing mill, a four-stand, 12-in. Morgan continuous mill, a 10-in. and an 8-in. mill. The product of the mill will include merchant bars up to 4-in. in diameter and small structural shapes. The annual capacity is estimated to be in excess of 100,000 tons. The rolling mill started operation in December and it was expected that it would be brought up to its full rolling rate early this year.

Mansfield Sheet & Tin Plate Co.

The Mansfield Sheet & Tin Plate Co., Mansfield, Ohio, during 1920 added four sheet mills which were placed in operation in July. In February this company began the erection of four 75-ton open-hearth furnaces, which it expects to have in operation in May this year, using these for the manufacture of sheet bars for the supply of its sheet and tin plate mills.

The Otis Steel Co.

The Otis Steel Co., Cleveland, began construction early in 1920 on a new 30-sheet mill plant adjoining its Riverside works. This will be equipped with 8 roughing and 8 finishing sheet mills arranged in two units, each unit driven by a 1000 h.p. motor, 8 continuous heating furnaces, 8 sheet furnaces and 7 box annealing furnaces. The product will include black and finished sheets, and the annual capacity will be 60,000 tons. It is expected that the plant will be ready for operation about June 1.

Black Steel & Wire Co.

The Black Steel & Wire Co., Kansas City, Mo., during 1920 completed and put in operation one 15-ton acid open-hearth furnace, a 3-high roughing mill, and a rod mill for rolling No. 5 wire rods.

The company plans to construct for 1921 an additional open-hearth furnace and blooming mill. The annual output from the open-hearth furnace is approximately 10,000 tons.

Utah Steel Corporation

The Utah Steel Corporation, Midvale, Utah, has recently completed arrangements with Arthur G. McKee & Co. for the construction of continuous, oil-fired, billet-heating furnace and has made arrangements for the construction of a crane run and a five-ton overhead traveling crane to serve this furnace. The company has also contracted for the erection of a 250-ft. by 80-ft. steel warehouse equipped with a 10-ton overhead traveling crane.

The company plans for this year the possible construction of a 200-ton blast furnace. Raw material resources are now being thoroughly investigated and as soon as the definite data are secured the company states that it will probably go ahead with the building of this furnace.

National Enameling & Stamping Co.

The National Enameling & Stamping Co., Granite City, Ill., in 1920, undertook extensive alterations in its open-hearth department, and installed piping for using both tar and coke oven gas as fuel in addition to the oil which has been used up to the present time. Additions to the open-hearth building have been made so that the company may use hot metal in its furnaces. There has also been installed a gas holder and a booster station. These latter developments are the result of the company's contracts with the St. Louis Coke & Chemical Co., from which it will receive 10,000,000 cu. ft. of gas, 16,000 gal. of tar, and 500 tons of hot metal per day. In making the above improvements it is estimated that the company's output will be increased from 350,000 tons to 450,000 tons per year. The company has increased its power plant capacity from 3000 to 6000 k.w. by installing an additional mixed pressure turbogenerator, running on exhaust steam from the large rolling mills.

The company is installing a 24-in. bar mill for making sheet bars with a capacity of 1200 tons per day.

The company states that during the past year it has spent practically $1,000,000 in additions both to increase production and bring about a more efficient practice throughout the entire plant.

Judson Mfg. Co.

The Judson Mfg. Co., San Francisco, Cal., completed early last year a new 30-ton open-hearth furnace, making a total number of three furnaces. The capacity of the open-hearth department is estimated at approximately 6000 tons per month. This year the company intends to complete an automatic stripper tower in the open-hearth department. Last year the company completed improvements to its rolling mill and now has continuous equipment consisting of one 19-in. bolt mill, one 16-in. bar mill and two 10-in. mills. The plant of this company has been entirely remodeled in every respect.

Nagle Steel Co.

The Nagle Steel Co., Pottstown, Pa., added to its Pottstown works one 54-in. tandem mill, two-high, roughing, three-high finishing in connection with which there are four heating furnaces, five 150-hp. boilers, one shear, one six-ton crane. The total capacity of this new mill is estimated at about 12,000 tons per year.

At its Seyfort works the company added two annealing furnaces and a five-ton crane, and at its Glasgow works, one 150-hp. boiler.

Apollo Steel Co.

The Apollo Steel Co., Apollo, Pa., has in process of erection the following additions to its sheet mill: Two jobbing mills, four sheet mills, new pickling equipment, two new galvanizing pots together with all necessary mechanical parts, five overhead traveling cranes, new warehouses, etc. It is expected that this addition will be completed about April 1 and that the capacity will be increased thereby to the extent of approximately 50,000 tons of finished sheets per year.

LaBelle Iron Works

The LaBelle Iron Works, Steubenville, Ohio, last year developed a large coal mining operation at Harmanville, Allegheny Co., Pa., which is now producing coal at the rate of something over 1000 tons per day and it is expected that this will be doubled in 1921. The company has also added considerable to its river transportation department, having placed 20 wooden barges and 15 steel barges in service; it expects to place in operation 25 steel barges early in the spring.

Donner Steel Co.

The Donner Steel Co., Buffalo, N. Y., put in operation last year an 8-in. merchant mill, motor driven, with seven continuous stands, six looping stands, a continuous heating furnace, gas producers, mechanical hot bed, overhead crane and shears. The capacity of this mill is stated 5000 to 8000 tons per month.

Youngstown Sheet & Tube Co.

The Youngstown Sheet & Tube Co., Youngstown, Ohio, last year completed its new No. 11 lap weld tube mill, details of which will be described in a later issue of THE IRON AGE.

Scullin Steel Co.

The Scullin Steel Co., St. Louis, Mo., last year erected a rolling mill consisting of one 22-in. mill, one 16-in. mill and one 12-in. mill, the outside cost of which was about $2,000,000. The company will be able to

roll bars up to six inch, flats, angles and sheets at the rate of 8000 tons per month. It will use six of its 12 open-hearth furnaces for the manufacture of ingots for this mill.

Wayne Steel Co.

The Wayne Steel Co., Erie, Pa., last year put into operation two 25-ton basic open-hearth furnaces. No other increase of capacity is contemplated this year. The company manufactures basic open-hearth steel and alloy billets.

Follansbee Brothers Co.

The Follansbee Brothers Co., Pittsburgh, now has under construction a new plant at Toronto, Ohio, consisting of four 40-ton open-hearth furnaces, a forging plant, a bar mill and 10 sheet mills, together with complete equipment for the production of high grade steel sheets.

Other Steel Works Additions

The Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa., installed in the last year a groove mill for the rolling of narrow steel, principally automobile rim steel. This was not exactly a new installation, but was practically an old mill set up to meet the urgent demand of customers. The company states that for this year several plans are under consideration, the carrying out of which will depend altogether on business conditions.

The Penn Seaboard Steel Corporation, Philadelphia, put in operation last year at its New Castle, Del., plant, a 34-in., two-high, motor driven blooming mill, having one roughing stand and a capacity of 800 tons per 24-hr. There was also added two soaking pits of four holes each and three gas producers. This mill was originally an 84-in. plate mill, but rebuilt for the new purpose.

A brief description of this plant appeared in THE IRON AGE, Dec. 30, 1920.

The Wisconsin Steel Co., Chicago, last year completed the construction at its South Chicago steel works of a new high line which takes care of supplies for the company's blast furnaces. This is regarded as the first work completed toward the new development of the company's open-hearth furnaces, and just how much further this will be carried forward depends on business conditions in the future. The new high line is of reinforced cement construction throughout. The company has under consideration the construction of a new dock and coal storage for its by-product coke ovens.

The Columbia Tool Steel Co., Chicago Heights, Ill., last year added one 30-pot crucible melting furnace and one 14-ft. Swindell annealing furnace to its equipment.

The Whitaker-Glessner Co., Wheeling, W. Va., has nearly finished at Portsmouth, Ohio, an 18-in. Morgan continuous mill for rolling sheet bars.

The American Steel Co., Pittsburgh, Pa., added one strip mill to its tin mill at Waynesburg, Pa. Improvements and new mill equipment at its Elwood City works have not been extensive.

NEW ROLLING MILL WORK

Enlargement of rolling mill capacity last year was fairly extensive when that of steel companies is considered.

The Newton Steel Co.

The Newton Steel Co., Youngstown, Ohio, completed and placed in operation in 1920 its new sheet mill plant at Newton Falls, Ohio, containing 20 sheet and pair furnaces, 10 roughing and 10 finishing sheet mills, 10 cold mills and 18 box annealing furnaces. Its product is black and finished sheets. Pulverized coal is used for firing all the furnaces and also under the boilers.

The Ashtabula Steel Co.

The Ashtabula Steel Co., Ashtabula, Ohio, during 1920 began the erection of a sheet mill plant that will have eight sheet mills, eight combination furnaces fired by powdered coal, two continuous annealing furnaces and two galvanizing pots. The sheet mills will be driven by a Unaflow engine made by the Northberg Mfg. Co., Milwaukee, Wis. This will be of the duplex type, with 28 x 36 in.-cylinders, driven at 150 r.p.m., and having a gear reduction of 5 to 1. The plant will not be completed until about July 1.

Reading Iron Co.

The Reading Iron Co., Reading, Pa., in May, last year, purchased the Susquehanna and Columbia Mills at Columbia, Pa., formerly belonging to the Susquehanna Iron Co. The estimated puddle bar capacity is 40,000 tons and the skelp capacity 36,000 tons per year.

The Eddystone Steel Co., Crum Lynne, Pa., installed last year an annealing furnace and states that it is now prepared to offer blue annealed sheets, No. 16 gage and heavier.

Indiana Rolling Mill Co.

The Indiana Rolling Mill Co., New Castle, Indiana, is installing a new sheet mill of three stands which will be ready for operation early this year. This consists of a 28-in. mill and will have a capacity of probably 120 tons in 24 hrs. The company has also completed an extension to its main mill building of 120 ft. which is rated as a 50 per cent addition. A new 30-in. by 48-in. engine to drive the new sheet mill has been purchased and the boiler house which was destroyed by fire last May has been rebuilt. A new office building, 60 ft. by 40 ft., is in the process of construction.

National Steel Rolling Mill Co.

The National Steel Rolling Mill Co., New York, with mill at Schuylkill Haven, Pa., last year increased the capacity of its 10-in mill from 10,000 to 15,000 tons of small bars per year. In 1921 the company plans to put in operation an 18-in. bar mill and also to build a small 8-in. mill for producing small sizes of merchant bars.

Chapman Price Steel Co.

The Chapman Price Steel Co., Indianapolis, Ind., is just completing its new sheet mill which it expects to have ready for operation in February. This plant consists of four hot mills, two cold and two roughing mills. The rated capacity is 25,000 tons per year.

National Rolling Mill Co.

The National Rolling Mill Co., Vincennes, Ind., last year constructed a steel yard building 400 by 83 ft., equipped with electrical cranes for yard work, and now has under way a building over its muck mill and boiler rooms 230 ft. long by 120 ft. wide, which will be later equipped with a monorail system for stocking furnaces, handling coal and removing slag and ashes. The company's plant is composed of a muck mill and 8 and 10-in. trains. There is under consideration for this year the equipping of one or two of the mills with electrical drive.

Other New Rolling Mill Work

The Western Rolling Mill Corp., Seattle, Wash., makes the interesting announcement that it is securing iron ore bodies in the Northwest which give good promise of hematite ore of sufficient value to warrant the construction of a blast furnace, which is contemplated as soon as details can be worked out.

The Atlas Crucible Steel Co., Dunkirk, N. Y., will have 20,000 tons additional rolling capacity for 1921, consisting of a 16-in. and 26-in. rolling mill to be used almost exclusively on alloy steel. It has added a 6-ton electric furnace, and is also building a large extension to its wire mill.

The Massillon Rolling Mill Co., Massillon, Ohio, has under construction a cold roll and finishing mill building, an annealing department, pickling house and storeroom. Some new equipment will be added and this, with the remodeling of the present plant, will increase its annual capacity to approximately 60,000 tons of finished sheets.

The Superior Sheet Steel Co., Canton, Ohio, com-

pleted and placed in operation during the year an eight mill sheet steel plant for the manufacture of black and galvanized sheets. This contains cold rolls, and annealing and galvanizing equipment.

The Eastern Rolling Mill Co., Baltimore, Md., erected last year a 30 by 54-in. finishing mill with 2 stands, a 30 by 44-in. finishing mill with 6 stands and a 30 by 34-in. finishing mill with 4 stands as well as balanced roughing mills 30 by 54-in. with 8 stands.

The Hammond Steel Co., Syracuse, N. Y., last year installed a five stand 10-in. mill for rolling tool steel bars.

The Watertown Arsenal, Watertown, Mass., last year installed a two stand 30-in. plate mill with cut herringbone gear drive, for rolling thin plates.

The Peerless Drawn Steel Co., Massillon, Ohio, last year installed a three stand 14-in. mill and a five stand 10-in. mill for rolling tool steel bars.

The Cambridge Steel Co., Cambridge, Ohio, last year installed a three stand 16-in. roughing mill and a six stand 14-in. mill for rolling merchant bars.

The Crucible Steel Forge Co., Cleveland, last year completed a 10-in. bar mill, 5 stands, 3-high, and also an 8-in. bar mill, 2 stands, 3-high.

The Milwaukee Rolling Mill Co., Milwaukee, expects to have its sheet mill ready for operation for the middle of January.

Superior Steel Corporation, Pittsburgh, Pa., with works at Carnegie, added last year one new 10-in. hot mill increasing the capacity approximately 25 per cent.

Blast Furnace Work

The Trumbull-Cliffs Furnace Co., Warren, Ohio, organized by the Cleveland Cliffs Iron Co., Cleveland, and the Trumbull Steel Co., Warren, Ohio, has under consideration a 600-ton blast furnace which will supply the Trumbull Steel Co. with pig iron. The stack will be 94 ft. in height and will have a 24 ft. diameter bosh and an 18 ft. 6 in. diameter hearth. Its completion is scheduled for about July 1. In connection with the furnace an ore handling bridge and a car dumper will be erected.

The Ford Motor Co., Detroit, completed during 1920 two blast furnaces at its new Rouge plant. The first furnace was blown in May 17, and the second stack, which was completed later in the year, has not yet been placed in operation. The furnaces, which are duplicate in design, are 92 ft. in height, 22 ft. 9 in. in diameter at the bosh and 17 ft. in diameter at the hearth. Other construction work carried on during the year at this plant included a new central power plant equipped with four water tube boilers, each of 2647 hp. capacity, a powdered coal plant and a large foundry.

The St. Louis Coke & Chemical Co., Chicago, completed last year at Granite City, Ill., a 500-ton blast furnace which it expects to put into operation about Jan. 10, 1921, and from which it expects to produce 200,000 tons of pig iron per year. A description of this plant can be found elsewhere in this issue of THE IRON AGE.

The Alan Wood Iron & Steel Co., Philadelphia, completed in 1918 a 500-ton blast furnace which was put into operation Jan. 8, 1920. No improvements were made last year and no increase in capacity is planned for 1921.

The Shenango Furnace Co., Pittsburgh, Pa., added to its plant at Shenango, Pa., new boiler capacity, increased electric generating units and improved pig casting machines. The company has signed a lease on a Virginia iron ore mine containing in the neighborhood of 1,000,000 tons, mostly Bessemer ore. Shipments from this probably will commence early this year.

The Thomas Furnace Co., Milwaukee, Wis., last year improved its blast furnace so as to secure greater efficiency by putting in labor saving devices. There has been installed a casting machine, skip hoist, served with electric larry cars, and a pig iron storage yard equipped with a gantry crane. It is expected that the furnace can be operated with less than half the number of men formerly employed, at the same time increasing output.

The Crane Iron Works, Catasauqua, Pa., last year rebuilt a 550-ton blast furnace which is 90 ft. high and has a diameter of 20 ft. 5 in. on the bosh and a stock-line of 15 ft.

The Thomas Iron Co., Hokendauqua, Pa., is rebuilding a 550-ton blast furnace which it expects to have in operation this year.

The Wharton Steel Co., Wharton, N. J., dismantled 3 old blast furnaces and in their stead erected 2 new 500-ton furnaces, 90 ft. high. The company is also building a Dwight & Lloyd sintering plant with a capacity of 900 tons of sinter per day. These new operations were described in THE IRON AGE, Oct. 7, 1920.

The Missouri Iron & Steel Corporation, Haigart, Mo., has under construction a charcoal blast furnace having a capacity of about 54,000 tons per year.

The Noble Electric Steel Co., Heroult, Cal., is building a small coke blast furnace which is expected to produce about 5000 tons of pig iron per year.

The Salisbury Iron Co., Lime Rock, Conn., this year has under construction a small charcoal blast furnace having a capacity of about 15,000 tons per year.

New Canadian Construction

The Steel Co. of Canada, Ltd., Hamilton, Canada, expects to complete this year an addition to its Canada Works for the drawing of wire and also the construction of a casting machine at its Hamilton Works. Last year at Hamilton there was a benzol recovery plant at the company's by-product ovens, and an extension was added to the bolt plant at Notre Dame, Montreal.

Dominion Foundries & Steel, Ltd., Hamilton, Ontario, is installing a new universal plate mill to roll universal plate up to 40 in. and sheared plate up to 60 in., in gages down to 3/16 in. This mill is expected to be in operation in January this year and will give the company an increased output of 15,000 to 20,000 tons per month.

The Dillon Crucible Alloys, Ltd., Welland, Ontario, Canada, last year installed a five stand 10-in. mill and cut herringbone gear drive for rolling tool steel bars.

Dominion Iron & Steel Co.

The Dominion Iron & Steel Co., Ltd., Sydney, Nova Scotia, completed in 1920: A 110-in. 3-high motor-driven plate mill, capacity 12,000 tons of sheared plates per month. In conjunction with this an extension of 264 ft. x 80 ft. was made to the casting bay of No. 1 open-hearth plant for casting slab ingots. An electric drive was installed for the 28-in. rail mill, consisting of a 3000 h.p., a.c. motor and reducing gear, housed in a brick building 48ft. x 40 ft. No. 3 power house, 85 ft. x 100 ft. was constructed; generating equipment consists of one 5000 k.w., two 3000 k.w. and one 500 k.w. turbogenerator sets and two 1000 k.w motor generator sets. Steam is supplied from blast furnace boilers nearby.

The company now has under construction and nearly completed: A new forge and electrical repair shop, 233 ft. x 73 ft.; a silica brick plant, capacity 3 million bricks per year; a runner and fire brick plant, capacity 500,000 runner, or 500,000 fire brick per year; a new power house at the company's iron ore mines, Wabana, Newfoundland. Boiler equipment consists of four, 500 h.p., B. & W. boilers equipped with Taylor stokers, and the generating equipment consists of two turbogenerator sets of 1250 k.w. each with surface condensers. Size of building is 100 ft. x 82 ft. There is also under way: An addition to No. 3 coke plant of one battery of 60 Koppers by-product coke ovens.

Machine Tool Industry Had Good Year

Despite Slump in Last Few Months, Sales Records Show Large Totals—Automotive Industries Large Buyers, but Railroad Purchases Below Expectations

MACHINE TOOL business in 1920 was, on the whole, very satisfactory, despite the unsettled conditions which prevailed in the last few months of the year. Buying started out in January at a high rate and continued with little interruption until mid-summer and in some instances until September. This business was taken at high prices, many manufacturers of tools having increased their prices over those which prevailed in the war period. Much of the activity in the early part of the year was due to the expansion in the automotive industries. Railroad buying was fairly good in some sections, particularly Chicago, but altogether was not up to expectations. Brief reviews of conditions which have prevailed during the year in principal machine tool selling centers are given below.

New York Market Active in First Half of Year

IN contrast to the conditions of business which are faced at the opening of 1921, the year 1920 opened very auspiciously for the machine-tool industry. The business boom that started about the middle of 1919 continued right through the holiday period, and in January the amount of business taken by dealers and factory sales representatives in New York was almost on a par with the best records of the war period. In fact, so pronounced was the buying spurt at the beginning of 1920 that THE IRON AGE made the following comment:

"Business in the first month of the new year has been so good that in some quarters there is a degree of apprehension lest the present conditions be symptomatic of over-expansion rather than a normal, healthy growth."

Machine tool builders got months behind on their orders and many of them were led to advance prices. Notices of these advances, which gave buyers only a few days' protection in some cases, brought in additional business. There was somewhat of a lull by comparison in February, which, however, was a very good month. About this time the situation which later developed into a tight money market began to make its appearance and caused some hesitation on the part of buyers. In March this hesitation was more pronounced and resulted in a few cancellations, which most tool builders readily accepted because there were several orders to fill for every machine so released.

The lull in buying was temporary, April and May being very good months, but the railroad strike troubles, which began in April, laid the foundations for the slump in business which developed a few months later.

There were more price advances in June, at which time there were the first evidences of a falling off in business. However, this was generally ascribed to the approach of summer, and it was really not until August or September that the signs of a serious slump in business became apparent.

In October talk among buyers about lower prices began and some manufacturers met this by an offer to guarantee their prices against decline. A few price reductions were announced about this time, but the majority of tool builders preferred to await a reduction in manufacturing costs. This was still the situation at the close of the year, when few formal announcements of price reductions had been made.

During the last quarter, cancellations of orders were frequent and presented a serious problem for many machine tool builders.

Business came from all quarters during the busy part of the year, but the automotive industries were a large factor. The Willys Corporation, which is building a large automobile plant at Elizabeth, N. J., bought several million dollars' worth of shop equipment, but much of this was cancelled or held up before the end of the year. The General Electric Co. was another large buyer for all of its plants, including some newly acquired at Rochester, Bridgeport and Fort Wayne, Ind. The Midvale Steel & Ordnance Co. bought about $500,000 worth of equipment early in the year for its car shops at Johnstown, Pa. Railroad orders were not plentiful in the East, but there was some buying, notably by the Atlantic Coast Line, whose orders amounted to about $600,000, and by the Norfolk & Western and Chesapeake & Ohio. There was scattered buying by other roads, but several of the largest carriers, which had lists of tools they wanted to buy, definitely postponed their purchases until 1921.

Railroads Fairly Active in Chicago Machine Tool Market

THE trend of the Chicago machine tool market in 1920 was the reverse of that in 1919. The first half of 1920 was a period of brisk business whereas the first half of 1919 was characterized by dullness. On the other hand, during the last six months of the 1920 business was on a steadily diminishing scale, while in the second half of 1919 buying was heavy. Curiously enough, Chicago machinery dealers find that the sales totals for the two years are about equal, with a slight advantage perhaps in favor of 1919.

In 1920 bookings were heaviest during the first three months of the year. Automotive manufacturers were still buying generously and expansion was taking place in practically all avenues of industry. Deliveries from manufacturers steadily grew worse until four to six months shipment was regarded as a normal condition. Numerous advances in prices were announced. In April the market was affected by the switchmen's strike, but nevertheless sales totals for that month were good, if not equal to those of January, February or March. Transportation difficulties lasted into May, and buying further diminished because of the shipping situation. Some machinery dealers used motor trucks for deliveries in Chicago and within a considerable radius from the city. Lake boat lines were used more extensively for shipping machinery. In June, cancellations were received from several automotive plants, and sales for the month were about the same as for May—50 to 60 per cent of the average for the first three months of the year. In July, further cancellations were received and collections became increasingly difficult. A strike of teamsters interfered with shipments from local stores during the latter part of this month and the early part of August.

From August until the close of the year, business developed on a steadily declining scale, railroad pur-

chases making the principal activity during this period. Strange to say, most of the railroad buying took place in the last six months of the year. Among the lines which bought equipment are the following: the Burlington, $200,000 worth; the Rock Island, $200,000; the Santa Fe, about $250,000; the Pere Marquette, $100,000; the Chicago & North Western, $65,000; the Union Pacific, $60,000; the Illinois Central, $50,000.

Cincinnati Industry Contended with Labor Troubles

THE machine tool industry in Cincinnati faced many difficulties during the year just closed. Opening very auspiciously, with all plants booked with orders sufficient to keep them busy many months ahead, the closing weeks of the year found many of them working short time, and with only sufficient orders on hand to keep them running four to six weeks. First signs of a let-up were observed in the latter part of May when a large automobile manufacturer withdrew an inquiry for machine tools. From that time on cancellations were received steadily, and during the months of July and August these amounted to a very large total. This condition continued till the close of the year and while no definite estimate is available as to the amount involved, there can be no doubt that it will run into millions of dollars.

The industry during the year also had to contend with a strike of machinists. This was called May 1, and met with only a half-hearted response from the employers of the various shops. Strenuous efforts were exerted to pull all the workers out but at no time did the number of strikers exceed 6,000 out of total of approximately 30,000 employees. The demands of the union were for a minimum scale of 75c. an hour for machinists, 60c. an hour for specialists, and 50c. an hour for helpers, but as most of the workers were already earning more than the scale called for they were not very enthusiastic about giving up their positions. The strike dragged along till the latter part of September when it suddenly collapsed, the strikers voting to go back to work under the old arrangements. The employers steadfastly refused to meet the union officials to discuss the situation, but were ready at alll times to take up any grievances with their own employees.

During the strike about 60 shops were directly affected and about 25 per cent of this number were closed for periods ranging from two weeks to two months. As conditions in the automobile industry became quieter more labor was available, and the places of the strikers were filled from this source until at the end of the strike shops which had been affected were running with practically normal forces. The result of the strike was a complete defeat for the union, and the strengthening of the position of the open shop in the industry, as practically all the plants are now running under a non-union working agreement with their employees.

The economic effects of the strike were to further retard deliveries of tools, which were then many weeks behind, and the loss of orders which would undoubtedly have come to manufacturers had they been in a position to quote reasonably early deliveries.

A review of the market for the year shows that business was very brisk during the first three months. The automotive industry was a heavy buyer, and purchases were also fairly large for European and South American countries. Falling exchange rates affected the export business from March on, though some scattered buying was reported during the remainder of the year. Practically all manufacturers of machine tools during the month of February advanced their selling prices 10 to 15 per cent. A number of fair-sized railroad lists were issued during the month of February, including the New Haven and Nickel Plate roads. A representative of the Russian soviet government visited Cincinnati during the month of March with the object of placing part of an order for $3,000,000 worth of machinery, but no purchases were completed. During the first quarter of the year the Ordnance Salvage Board of the United States Government shipped over a quarter of a million dollars' worth of tools to Belgium.

From April to June a slight falling off in inquiries was noticed, both from domestic and foreign sources. The first week in May the Norfolk & Western Railroad issued one of the largest lists of the year, calling for approximately 70 tools. Smaller lists were also issued by the L. & N. and Hocking Valley Railroads. The switchmen's strike affected the industry for a short period during the months of April and May.

During the early part of July, some orders were received from railroads and South American countries. Many of the inquiries received specified early deliveries and as many plants were still affected by the strike the greater part of this business was placed in other markets. During the latter part of July and early part of August heavy cancellations were received from automobile parts and tire manufacturers.

Some railroad buying was reported and quite a few inquiries were received from Pacific Coast points early in October. Foundries further reduced their operations at this time, many of them going on a 4-day a week schedule. At the end of October some machine tool manufacturers had practically caught up with deliveries and had reduced their working hours from 48 to 40 a week. Part of the output was being placed in stock, the first in some years. During November and December business continued quiet, though occasional spurts in buying were noticed. Much talk of lower prices was heard during these months, but manufacturers held firmly to their quotations and some of them were guaranteeing prices against decline until April 1, 1921. Further reductions of forces and working hours were made during December, and though the market was quiet at the end of the year, manufacturers were optimistic over the prospects for a fair year's business during 1921.

Curtailment in Automobile Industry Hurt Cleveland Trade

THE machine tool trade in the Cleveland territory during 1920 experienced the two extremes, a heavy volume of business in the early part of the year, which tapered off to a very limited demand during the last few months. In this respect the year was somewhat similar to 1919. However, in the previous year the dull period came at the beginning of the year and the active period during the latter part of the year. As the bulk of the machine-tool business during the year came directly or indirectly from the automotive industry, the curtailment in the automobile field during the late spring and summer quickly affected the machine tool business.

The year 1920 started with a heavy volume of business and a promising outlook for the entire year. The automotive industry began to buy a great deal of machinery to carry out record-breaking production schedules which it had planned. A good volume of business was placed by builders of automobile parts and also by builders of motor trucks and tractors. Probably the heaviest buyer during this period of expansion was the General Motors Corporation, which purchased a large amount of machinery to round out equipment in its various pants. The demand slowed down a little in February, the first cause of falling off in orders apparently being delayed deliveries. As a result of the heavy bookings late in 1919 and in the first few weeks of last year, machine tool builders were four months or longer behind on shipments. In March other unfavorable conditions appeared that caused a further lessening in the demand. These included railroad embargoes and the coal shortage that interfered with plant operations, and a tightening of the money market. In the meantime machine tool prices had been advancing and high prices had some effect in restricting buying. Another factor that further retarded sales in April was the railroad strike that paralyzed industry. Cancellations began to appear and buyers assumed a more conservative atti-

tude, placing orders for only such machinery as they urgently needed.

In spite of the falling off in orders after the first few weeks of the year the machine tool market continued fairly good until May. During that month there was a marked slump in orders. Automobile manufacturers were unable to keep up to scheduled production because of a shortage of material resulting from the railroad strike, the unsatisfactory labor situation due to inefficiency of workmen became a disquieting factor and the talk of readjustment of the commodity prices had some general effect on general business conditions. The demoralized transportation situation made it next to impossible to ship machinery after it was sold. With business handicapped by the numerous unfavorable conditions, buyers who had inquiries out began to defer the placing of orders. June was a dull month with sales limited mostly to single machines for immediate delivery. This month brought further cancellations from the automobile industry.

Buying during the last half of the year was light, business showing a little change from week to week, although the volume of orders gradually grew less. September found some of the machine tool builders caught up on deliveries and making machines for stock. With high manufacturing costs some of these felt that it was not advisable to accumulate a great deal of stock and began to lay off men and curtail production. A slowing down in operations in the metal working industries resulted in further cancellations of orders placed months previously, buyers not needing the machines when builders got near delivery dates.

During the fall machinery users began to talk about lower prices and their expectations of a decline led to demands that prices be guaranteed against a decline for a certain period, usually four to six months. Quite a few of the machine-tool builders gave this guarantee. Price reductions did not materialize except from a very few manufacturers and many inquiries, some involving fair sized lots of machines, were held up apparently waiting for lower prices. Quite a few of these inquiries are still dormant.

Outside of the automobile industry there was no marked activity in the Cleveland machinery market during 1920. Railroad buying was light and there was little foreign business. Plant extensions were few, as most of the metal working plants had extended so much during the war time period that even had they enjoyed good business they would not have needed additional room, and the number of new industries requiring metal working tools was small.

Two important additions were made to Cleveland machine tool plants during the year with the completion of new plants by the Foote-Burt Co., builder of drilling machines, and of the Colburn Machine Tool Co., builder of drilling and boring machines.

New England Trade Slumped Fully 80 Per Cent

NEW ENGLAND machine tool business conditions in 1920 were the reverse of those in 1919. Broadly speaking, business was quiet during the early part of 1919, but from spring until the close, there was a healthy steady increase in the demand for and output of machinery. In 1920, business was better during the first half than it was in the last.

The apex in the 1920 buying movement came in February, but it nevertheless continued unusually good until toward August, when there was a noticeable slump which extended through September. In October there was a brief recovery, but in November the downward trend was resumed. By the close of the year business dropped almost to a point of stagnation. The difference between sales at the peak of the buying movement and those for December, as reported by individual concerns, represents a drop of approximately 80 to 85 per cent.

In analyzing the 1920 buying movement it is found the textile machinery makers and allied concerns were steady purchasers from Jan. 1 until July and August. During the remainder of the year they bought comparatively little. The only New England railroad buying that amounted to anything was in August. The peak of buying by electrical equipment producers came in February. Miscellaneous buying of machine tools was excellent until April. From then until toward August it held fairly well, and then tapered off to small proportions.

The export business, which promised much, did not materialize as anticipated, the rates of exchange on foreign countries together with purchases of German made tools by European countries proving too great a barrier against American products.

The estimated New England gross sales for 1920 are about on a par with those for 1919. The 1920 net sales, however, compare less favorably due to poor accounts. Only one of the important machine tool houses in Boston reports an increase over 1919, this being approximately 25 per cent. The fact that this house was not obliged to appear at a creditors' meeting, in a large measure, accounts for its 1920 record.

The year closed with the machine tool manufacturers on a real competitive basis for the first time since 1916, and with considerable uncertainty regarding machinery values. Yet the outlook for the new year is brighter than conditions at the close of 1920 indicate.

Considering the stress placed on active metal-working equipment during and since the world war, both by production schedules and by misuse by inefficient labor, the aggregate amount of second-hand equipment on the market is remarkably small. In addition, that great 1919 bugbear is removed, i.e., the overshadowing of the market by surplus Government owned machine tools. Insofar as New England is concerned this surplus practically is eliminated.

Business prospects are visible in the railroad, textile, electrical and machine shop fields. Two New England railroads have 1921 budgets which will be acted on when Government funds are provided through the compensation act. Cheaper cotton and woolen fabrics are a certainty, which spells greater activity in the textile machinery industry and allied lines. New Bedford and Fall River mill owners are and have been figuring on replacements in machine shop equipment. With the natural development in the electrical field each year, greater expansion in the manufacture of appliances is a necessity and electrical appliance producers have rather elaborate 1921 programs.

During the war and until that time when the slump in the automobile industry took place last year, the average New England machine shop was engaged either in quantity production of munitions or automobile parts or in quantity production of screw machine products. Owners of such establishments are either now engaged in the manufacture of some product issued under the name of the establishment or that of an individual directly interested in it, or making every effort to do so. Indications point strongly to inventions suggested during the war and since then making their appearance on the 1920 market. The probabilities are that New England's standing as a machine shop center in the country will be considerably augmented during the coming year.

A Few Large Orders Placed in Pittsburgh District

DURING the early part of the year a very fair amount of machine tool business was done in the Pittsburgh district, among the lists closed being that of the Aluminum Co. of America for the plant recently completed at Marysville, Tenn., about 30 tools being included in this list, and the new Lester, Pa., plant of the Westinghouse Electric & Mfg. Co., bids for the equipment of which were placed in this district. Outside of several cranes there was equipment for the foundry, forge and machine shops. Another big contract which was closed in this district early in the year was for the new plate and structural mill of Algoma Steel Co.,

Sault Ste. Marie, Ont. Contracts for about $3,000,000 worth of equipment were let for this project but work on this construction was stopped some time ago and the orders held up.

There was some little railroad buying during the early part of the year but it was extremely disappointing in volume owing to the fact that the railroads were expected to be heavy buyers upon their return to private management. As is common in this district, the bulk of business, not only in machine tools but in cranes and other kinds of equipment, comes directly or indirectly through the steel industry. Companies like Mesta Machine Co., Mackintosh-Hemphill Co., Lewis Foundry & Machine Co. and the National Roll & Foundry Co., strictly builders of steel mill equipment, had considerable business, but the foreign demand far exceeded that of domestic manufacturers. Since the money situation grew tight and general business has declined, business has been confined very closely to actual requirements.

Machine tool dealers had considerable difficulty in securing tools on account of transportation conditions, and labor troubles both in New England and Cincinnati also proved a hindrance.

Several electrical appliance companies, following the freight rate increase effective Aug. 26, advanced prices on all sizes of motors, except the very small ones, 15 per cent.

The Week's Market

New York

NEW YORK, Jan. 4.

The year closed with the local machine-tool trade feeling that if the new year brings any early change in conditions such changes will be for the better. Taking actual sales as a basis of comparison, the business in tools being done at the close of 1920 was probably not in excess of 10 per cent of that which was done at the beginning of the year. Such a falling off in business within one year has seldom, if ever, been known in any previous periods of depression. The past week has brought forth no new inquiries of importance. It is expected that the Erie Railroad will begin this week to place orders for a number of heavy tools, for which it inquired several weeks ago. Other railroad business is in prospect, but there is nothing definite as yet.

Some lathe manufacturers have reduced prices from 12½ per cent to 20 per cent, effective Jan. 21.

A number of good inquiries for overhead traveling cranes are in the market. Takata & Co., 50 Church Street, New York, are inquiring for a list of cranes for export to Japan, which includes one 20-ton, two 30-ton and one 60-ton overhead traveling cranes. The International Nickel Co., 43 Exchange Place, New York, will probably close this month for a list of seven electric cranes of various sizes. The Standard Oil Co. of New Jersey, is expected to close shortly for a 30-ton locomotive crane for Rahway, N. J., and the Standard Oil Co. of New York, will place an order for a 30-ton locomotive crane for export to South America. The 200-ton and 50-ton overhead traveling cranes recently inquired for by Frazar & Co., New York, for export to Japan, have been awarded to a Japanese shipbuilding and engineering company, Ishi Kamashima & Co. of Japan. Wessel Duval & Co., 25 Broad Street, New York, will close within a week for a 30-ton overhead traveling crane for export to Chile. The Lord Construction Co., New York, has purchased a 20-ton, 47-ft. span overhead traveling crane from the Niles-Bement-Pond Co.

The A. C. Chesley Co., 277 Rider Avenue, New York, manufacturer of hollow metal fireproof doors, metal-covered doors, etc., has arranged for the erection by day labor of its new two-story plant, 50 x 200 ft., estimated to cost about $100,000. P. J. Murray, 141 East Fortieth Street, is architect.

The General Optical Co., 256 Washington Street, Mt. Vernon, N. Y., manufacturer of lenses, frames, etc., will take bids in February for the erection of a one-story addition, 30 x 200 ft., to cost about $75,000 including precision and other equipment.

F. Aliano, 245 Forty-fourth Street, Brooklyn, manufacturer of hardware specialties, is planning for the erection of a one-story addition to cost about $35,000.

The Athenia Steel Co., 135 William Street, New York, manufacturer of spring steel, etc., with plant at Athenia, N. J., has filed notice of increase in capital from $750,000 to $1,500,000. E. M. Bath is secretary.

The Phoenix Tube Co., 182 North Eleventh Street, Brooklyn, manufacturer of brass, bronze and aluminum tubing, has increased its capital from $300,000 to $550,000.

The Whitall Tatum Co., 46 Barclay Street, New York, has had plans prepared for a two-story and basement building, 35 x 106 ft., at its scientific glass manufacturing plant, Millville, N. J., to be equipped as an experimental machine works.

The Schaeffer & Budenberg Mfg. Co., 84 Broadway, Brooklyn, manufacturer of steam gages and other precision equipment, with plant at 338 Berry Street, has increased its capital from $100,000 to $1,000,000.

The Empire Tube & Steel Corporation, College Point, L. I., is completing plans for its new plant in the vicinity of Buffalo, to be one-story, 100 x 240 ft., brick and steel.

Randolph Ember, 11 Kink Street, Brooklyn, has awarded a contract to Thomas Drysdale, 250 Baltic Street, for a one-story foundry, 57 x 96 ft., on Delevan Street, to cost about $25,000.

New England

BOSTON, Jan. 3.

The largest single transaction in machine tools noted in several weeks involves 38 automatic screw machines, a Hartford, Conn., manufacturer being the purchaser. The deal involves between $150,000 and $200,000 and includes tools crated for export to Russia. Aside from this, sales have been few. One large manufacturer, who contemplated placing additional orders for equipment before the close of 1920, signifies his intention of remaining out of the market until prices are lower. It is reported that a Worcester, Mass., manufacturer will shortly be in the market for $30,000 to $40,000 of equipment, mostly lathes.

A fairly large number of inquiries for sheet metal working machinery from stamping, pressed steel and bed manufacturing interests is noted, and indications are that some of these will result in business in the near future.

Inquiries are out on one 25-ton, two 15-ton and one 10-ton cranes, and a few others are still under negotiation.

One line of split and steel pulleys has been marked down 10 per cent, and indications are that at least one other line will be reduced. The price on jack screws has been lowered 5 per cent.

The Mansfield Foundry Co., Mansfield, Mass., has completed a one-story, 90 x 120 ft. addition which will provide a total output of 25 tons per day or double its present capacity. There will be no increase in the cupola equipment, but a complete sand blast outfit and other machinery will be installed. The plant is equipped with a 10-ton crane, but the company is considering the installation of a larger crane.

The Blancke Twist Drill & Tool Co., Taunton, Mass., is considering the installation of cutters, milling and rolling machines in an addition to increase its capacity about one-third. Nothing definite has been decided upon, however. The company recently added the manufacture of milling cutters to its line of twist drills, under the direction of Frank Burns, formerly of the Morse Twist Drill & Machine Co., New Bedford, Mass.

The five-story and basement, 25 x 125 ft. manufacturing building contemplated by the New England Iron & Metal Co., Manchester, N. H., has been held up until spring. The owner is getting estimates on materials, however.

The Coates Clipper Mfg. Co., Worcester, Mass., has increased its capitalization from $15,000 to $200,000. Money derived from the sale of the additional stock will be used to develop a flexible tubing, a new product of the company.

Palmer Brothers, Cos Cob, Greenwich, Conn., manufacturers of gasoline engines, etc., have increased their capital from $250,000 to $500,000.

The Sharp Rotary Ash Receivers Corporation, Springfield, Mass., has been incorporated with a capital of $600,000 by Frederick U. Wells, George F. Leary and Henry S. Waldron, 100 Marengo Park, to manufacture special ash-handling equipment for power plant service.

The G. E. Prentice Mfg. Co., New Britain, Conn., manufacturer of buckles and other metal specialties, has increased its capital from $100,000 to $300,000.

The Immick Co., Meriden, Conn., general building con-

tractor, will build a new forge and blacksmith shop, and make other extensions at its works on State Street, estimated to cost about $25,000.

Philadelphia

PHILADELPHIA, Jan. 3.

Alfred Box & Co., Inc., 813 North Front Street, Philadelphia, manufacturer of hoisting machinery, cranes, etc., has plans under way for a two-story factory, 38 x 42 ft., at Trenton Avenue and Tioga Street. Bids are expected to be asked this month.

The Ellwood Ivins Tube Works, Inc., Oak Lane Station, Philadelphia, manufacturer of pipe, tubing, etc., has plans under way for rebuilding the section of its plant, recently destroyed by fire. The work will include the erection of a one-story, steel frame building, and is estimated to cost in excess of $150,000.

The Stokes & Smith Co., Summerdale Station, Philadelphia, manufacturer of machinery and parts, has filed plans for a two-story extension, 50 x 200 ft., and improvements in its present plant.

Fire, December 25, destroyed a portion of the plant of the Allentown Steam Heating & Power Co., 23 South Hall Street, Allentown, Pa., with loss reported at $60,000. It will be immediately rebuilt. The company furnishes utility service in the business section of the city.

The F. J. Stokes Machine Co., Seventeenth and Cambria streets, Philadelphia, manufacturer of chemical machinery, will hold in abeyance the erection of its new one-story plant, 91 x 140 ft., on Tabor Avenue. Contract was awarded recently to John N. Gill & Co., Otis Building.

Johnson & Lund, Philadelphia, is being organized by B. R. Johnson, A. L. Detwiler and F. M. Potter, to manufacture precision equipment for dental service, including instruments and machinery. Application for a State charter will be made on Jan. 24. Sheldon F. Potter, West End Trust Building, represents the company.

The Safety Appliance Co., Philadelphia, is being organized by F. Marshall Johnson, Horace S. Friedenwald and Arthur R. Konsalik, to manufacture industrial safety appliances for metal-working, welding, etc. Application for a State charter will be made on Jan. 24. Robert Mair, Seventeenth and Sansom streets, represents the company.

Chicago

CHICAGO, Jan. 3.

Very little business was booked between the holidays. The only development of interest was the announcement of price reductions by two Western manufacturers of engine lathes, 7½ per cent in one case and 10 per cent in the other. It is hoped that when users complete their inventories they will discover needs to bring them into the market. With revenues declining concurrently with diminishing traffic, the railroads are becoming more conservative and few new orders from them are expected in the near future.

The Pioneer Truck Co., 4638 West Madison Street, Chicago, has had plans prepared by Ronneberg, Pierce & Hauber for a one-story automobile truck plant, 300 x 600 ft., at Valparaiso, Ind., to cost $500,000.

The American Rubber Co., 1526 South Wabash Avenue, Chicago, has awarded contract to the W. G. Brown Consulting Co., 2201 Union Central Building, Cincinnati, for a two-story factory, 60 x 400 ft., with power plant at Centralia, Ill., estimated to cost $150,000.

The Illinois Malleable Iron Co., 1801 Diversey Boulevard, Chicago, has let contracts for a one-story power plant, 90 x 100 ft., to cost $175,000.

The plant of the Helmsbacher Rolling Mill Co., a subsidiary of the American Car & Foundry Co., Madison, Ill., was recently destroyed by fire. The loss was estimated at $1,000,000.

The Caswell Mfg. Co., machinist and founder, Cherokee, Iowa, has purchased ground for the construction of additions.

The Globe Iron Works, 432 Lake Avenue South, Duluth, Minn., has purchased the former planing mill of the Red Cliff Lumber Co., at Thirty-ninth Avenue West and Oneota Street, and will remodel the structure into a machine shop and foundry.

The Felt & Tarrant Mfg. Co., 1701-17 North Paulina Street, Chicago, manufacturer of adding and calculating machinery, will defer the erection of its addition until spring. It will be six stories, 60 x 240 ft., and is estimated to cost close to $1,000,000 with machinery. L. G. Hallberg & Co., 118 North Michigan Avenue, are architects.

The Vermillion Malleable Iron Co., Chicago, has increased its capital from $125,000 to $300,000.

The Chicago Spring & Wire Co., 322 North Albany Avenue, Chicago, will take new bids at once for the erection of the superstructure for its two-story plant, 75 x 117 ft., estimated to cost about $40,000. Contract for the foundation was awarded recently to Benson & Peterson, 437 Leclaire Avenue.

The Chicago Malleable Castings Co., Center Avenue and West 120th Street, Chicago, has increased its capital from $100,000 to $1,500,000.

Fire, Dec. 22, destroyed the plant of the Huber Mfg. Co., Fargo, N. D., manufacturer of agricultural implements, with loss estimated at about $100,000.

The James A. Brady Foundry Co., Chicago, has increased its capital from $300,000 to $1,000,000.

The Norton Door Closer Co., Chicago, has acquired about 60,000 sq. ft. at the northwest corner of Western Avenue and George Street, for a new plant. The initial works, estimated to cost about $75,000, will be added to with another building at a later date.

Baltimore

BALTIMORE, Jan. 3.

Lyon, Conklin & Co., 13 Balderston Street, Baltimore, manufacturer of sheet metal products, will take bids in February or early in March for its new plant at Donaldson and McComas streets, on property recently acquired. It will be one-story, and is estimated to cost close to $300,000. Edgar Lyon is president.

The International Machine Co., 110 East Lexington Street, Baltimore, has been incorporated with a capital of $100,000 by George P. Chambers, Huntington D. Hawkins and F. L. Klemm, to manufacture machinery and tools.

The Construction Quartermaster Department, Washington, has awarded a contract to the Belmont Iron Works, Twenty-second Street and Washington Avenue, Philadelphia, for a new airplane hanger, boiler plant and generator plant at the Government Arsenal, Aberdeen, Md., to cost about $150,000.

The American Oil Co., American Building, Baltimore, has preliminary plans under way for a new two-story refinery on Haines Street, to cost about $200,000. George R. Callis, 610 American Building, is architect.

Machinery and equipment to cost about $100,000 will be installed by the Queen City Brick & Tile Co., Cumberland, Md., in connection with extensions and improvements estimated to cost about $50,000 additional. The present steam power operation will be changed to electric operation.

Farrington & White, Greensboro, N. C., are considering the establishment of a plant for the manufacture of automobile parts.

The manufacture of automobile gears, etc., is planned by the Columbia Machine Works, Columbia, S. C., recently organized. J. E. R. Goodman is manager.

Plans for the erection of an addition and the installation of machinery are being made by the F. N. Hayes Machine & Motor Co., Roanoke, Va.

Pittsburgh

PITTSBURGH, Jan. 3.

The closing week of 1920 was marked by an almost utter lack of business in machine tools or cranes. The American Window Glass Machine Co. as yet has done nothing against its revived inquiry for 10 or 12 tools. It is probable that the Rigby Valve & Machine Co., Sharon, Pa., recently incorporated to manufacture a liquid fuel regulating valve, and which will operate a machine shop and grinding works, will be in the market before long for some equipment. The crane market is extremely inactive. It is currently reported that the Cambria Steel Co. has decided not to buy two mill cranes for its new by-product plant under construction, but will buy instead standard type cranes. This plant is being built by the Semet-Solvay Co., which will have the placing of the crane orders.

The Air Reduction Sales Co., 2515 Liberty Avenue, Pittsburgh, and 120 Broadway, New York, is considering plans for a one and two-story factory, 80 x 140 ft., on property recently acquired on Ridge Avenue, Northside. It is estimated to cost in excess of $100,000, and bids will probably be asked in the spring.

The Pittsburgh Malleable Iron Co., Thirty-fourth and Smallman streets, Pittsburgh, manufacturer of iron and steel castings, etc., is taking bids for a new building at Thirty-fifth Street and Spruce Alley.

The Charleroi Iron Works, McKean Street, Charleroi, Pa., will take bids early in the spring for the remaining work for its addition, estimated to cost about $75,000. The foundation has been completed.

The Monongahela Valley Traction Co., Fairmont, W. Va., will build an electric power plant at Perry Station, near

Clarksburg, W. Va. It is proposed to break ground at once.

The State Prison Farm, Moundsville, W. Va., J. Z. Terrell, warden, is planning for the construction of a coal tipple in connection with mining operations conducted by inmates.

A new five-story automobile service building and repair works, 82 x 125 ft., estimated to cost about $125,000 will be constructed by the Twelfth Street Garage Co., Wheeling, W. Va. It is expected to call for bids early in February. Plans are being prepared by C. W. Bates, 77 Fourteenth Street, architect. E. A. Baden is president.

The American Gas & Electric Co., 30 Church Street, New York, is considering the erection of a new electric generating plant in the vicinity of Powhatan, Ohio.

The Windsor Coal Co., Beech Bottom, W. Va., is arranging for the early installation of machinery in its new one-story machine shop, 50 x 140 ft., now in course of erection and estimated to cost $50,000.

Cincinnati

CINCINNATI, Jan. 2.

A machinery dealer from Chicago, and presumably representing the Russian Government was in Cincinnati recently making inquiries as to prices of tools. While he was not prepared to close any deals, he let it be known that a good trade can be worked up with that country. In view of recent developments, local manufacturers, however, are inclined to take the view that the visit of this dealer was more or less in the nature of an attempt to interest manufacturers in having the Soviet government recognized by authorities at Washington, the bait of big orders being held up as an inducement. So far as can be ascertained, no manufacturers in this district have had dealings with the man referred to, though it was reported that one corporation in the State had been definitely offered about $300,000 worth of business. This, however, cannot be confirmed.

Some local plants were closed for the holidays, while others operated at capacity. As a whole, about 70 per cent is the average operation at present.

The William Lang & Sons Co., structural and ornamental iron worker, Cincinnati, has purchased property on Beekman Street, in the Fairmount section, and it is understood that its contemplated plant will be erected there this year.

The American Tool Works Co., Cincinnati, machine tool manufacturer, has increased its capitalization from $300,000 to $2,400,000. No definite announcement has been made as to the purpose for which the increase was authorized, other than for taking care of the future needs of the company.

The Century Machine Co., manufacturer of bakers' machinery, Cincinnati, has been authorized to increase its capitalization from $25,000 to $125,000. No extensions are contemplated at present.

The Progressive Sheet Metal Co., Cincinnati, has leased from the C. R. Talbott Co., the ground floor of the building at 2225 Bogen Street, containing about 40,000 sq. ft. of floor space, and after alterations are completed will remove its plant from its present location.

The Highway Engine Co., Defiance, Ohio, incorporated for $1,500,000 to build automobile truck engines, has plans under way to begin the construction of its plant in the spring.

Contracts for the erection of a one-story addition, 46 x 115 ft., to the plant of the Tool Steel Gear & Pinion Co., Elmwood Place, Cincinnati, have been let to the H. K. Ferguson Co., Cleveland.

The Lucas-Miner Tool & Production Co., Dayton, Ohio, has purchased the Schantz Co.'s building at 427 Valley Street, and will enlarge its plant. It manufactures fire equipment outfits and air compressors. James Westendorf is president.

Cleveland

CLEVELAND, Jan. 3.

The machine tool trade is awaiting developments to determine whether quotations made on recent inquiries, but held up until after the first of the year, will result in the early placing of orders. The past week was dull. Some orders were taken for single machines and one local inquiry came out for eight tools.

The only price change noted is a cut of 10 per cent on its line of lathes by the South Bend Lathe Co., South Bend, Ind. Builders of handling equipment report an improved volume of inquiries, particularly from railroads for coal handling equipment.

Most of the local industrial plants were shut down over the holidays but resumed operations this week. Cleveland foundries are now operating at about 25 per cent of capacity.

The Putnam-Martin Co., Cleveland, will build a plant on West Seventy-third Street, adjoining that of the Kelly Reamer Co., for the manufacture of metal and wood specialties and advertising novelties. H. C. Putnam, president, Kelly Reamer Co., is also at the head of the Putnam-Martin Co.

The Ideal Electric & Mfg. Co., Mansfield, Ohio, is preparing plans for an addition, 100 x 430 ft. It is completing extension, 160 x 430 ft.

The Sunbury Mfg. Supply Co., Sunbury, Ohio, has outgrown its present quarters and is looking for a new site for a plant. It manufactures road scrapers and draggers and stone unloaders.

The Federal Radiator Co., Zanesville, Ohio, has increased its capital stock from $500,000 to $1,000,000.

The Haugher Wheel Mfg. Co., Toledo, Ohio, recently incorporated with a capital stock of $1,000,000, has completed its organization by the election of J. C. Fair, president and general manager; Ora Justice, vice president; A. W. Shields, secretary, and J. F. Angell, secretary. The company expects to place its plant in operation March 15.

Detroit

DETROIT, Jan. 3.

Although the machine tool market in this district remains quiet, a better feeling is noted among dealers, due to an improvement in the automotive situation the last few days.

A two-story factory, 100 x 160 ft., will be erected at Martin and Southern avenues, Detroit, for the Federal Screw Works.

The American Machine Products Co., Eighteenth and Howard streeets, Detroit, is in the market for additional machine tool equipment.

The A. J. Detlaff Co., 121 East Lafayette Avenue, Detroit, manufacturer of iron castings, etc., has rescinded former contracts awarded for its new plant, and bids on revised plans are being taken. The building will be one-story, 51 x 87 ft. Albert Kahn, 1000 Marquette Building, is architect.

The Michigan Bolt & Nut Works, Meldrum Avenue, Detroit, has increased its capital from $300,000 to $400,000.

The American Stamping Co., Battle Creek, Mich., has preliminary plans under way for a one and two-story, brick and concrete building. It recently increased its capital from $75,000 to $500,000. Joseph C. Llewellyn, 38 South Dearborn Street, Chicago, is architect. H. B. Sherman is president.

Considerable mechanical equipment and machinery will be installed in the new engineering shops and laboratories to be erected by the University of Michigan, Ann Arbor, Mich. The buildings are estimated to cost approximately $1,000,000. M. L. Burton is president.

Catalogs Wanted

The Calumet Truck Body Corporation, Calumet, Mich., desires catalogs and prices from manufacturers of malleable fittings and drop forgings for truck and cab bodies; also prices on tools and shop equipment.

Milwaukee

MILWAUKEE, Jan. 3.

New business the final week of the old year declined to a low point, but inquiries showed considerable betterment and a fair volume of orders is expected.

The Simms Foundry Co., Racine, Wis., has amended its articles of incorporation to provide for an increase in capitalization from $40,000 to $100,000.

The Allen-Bradley Co., 284 Greenfield Avenue, Milwaukee, manufacturer of electric controlling devices, has increased its authorized capitalization from $186,000 to $250,000 to accommodate the expansion of its business.

The Terra Fuel Co., Superior, Wis., contemplates the construction and equipment of a new fuel briquetting plant costing about $75,000 early in the spring. A. F. Chadwick is treasurer and general manager.

The Vollrath Co., Sheboygan, Wis., manufacturer of enameled ware and utensils, has increased its capital stock from $500,000 to $1,000,000. It is building an addition and making purchases of stamping and other equipment. J. J. Vollrath is president and general manager.

The Board of Education, Webster, Wis., has engaged E. J. Hancock, architect, Lurie Building, Eau Claire, Wis., to design a new high school and vocational training institute, two stories, 160 x 175 ft., to cost about $185,000. Bids will be taken about Feb. 1.

The Toy Co. of America, Appleton, Wis., has increased its capital stock from $25,000 to $100,000. It was organized early in 1920 and occupies part of the Graef Mfg. Co.'s plant.

but next spring contemplates the erection of its own factory. C. L. Wiggin is president and general manager.

The Twin Ports Steel & Tractor Co., Superior, Wis., manufacturer of tractors and automotive parts and materials, has increased its capital stock from $10,000 to $100,000.

The Pawling & Harnischfeger Co., Milwaukee, manufacturer of electric traveling cranes, boring mills and other machine tools, has increased its authorized capitalization from $1,000,000 to $3,000,000. It has been engaged for the last two years in an extensive plant development program which the new issue is to cover. Henry Harnischfeger is president and general manager.

The Sheboygan Cold Storage Co., 936 North Water street, Sheboygan, Wis., will build a new plant, with artificial refrigerating equipment, to cost about $75,000. Edward Peacock is president and general manager.

The trustees of St. Mary's Hospital, Wausau, Wis., have engaged E. Brilmeyer & Sons, architects, 432 Broadway, Milwaukee, to prepare plans for a new boiler house and laundry to cost between $250,000 and $275,000. It will be four stories, 50 x 145 ft. Bids will be taken about Feb. 1.

The Board of Education, Goodman, Wis., has engaged Edward Tough, architect, Madison, Wis., to design a new high and industrial training school, two stories and basement, 90 x 125 ft., to cost about $165,000. Bids will be taken about Feb. 15. Dr. J. Gomber is president of the board.

The Kahlenberg Brothers Co., Two Rivers, Wis., manufacturer of marine engines, has increased its capital stock from $75,000 to $300,000.

The Central South

ST. LOUIS, Jan. 3.

The Machinery & Supply Co., Joplin, Mo., recently organized by interests of the United Iron Works Co., Ridge Arcade Building, Kansas City, Mo., with plants in other cities, is arranging for the erection of buildings at Fourth Street and School Avenue, Joplin, to form new works. It is expected to begin construction at an early date. The parent company specializes in the manufacture of mining machinery, and the new organization will take over and operate the rebuilt machinery branch of the business. J. V. Henry is secretary.

The Curtis-Robertson Aircraft Corporation, St. Louis, manufacturer of airplanes and parts, has changed its name to the Robertson Aircraft Corporation.

The Osborn Automatic Damper Co., Pueblo, Colo., is planning for the erection of a new factory at Garden City, Kan.

The Farm Implement Co., Muskogee, Okla., has been incorporated with a capital of $25,000 by H. M. Trice, C. E. Bigford and T. H. Hartmus to manufacture agricultural implements and farm machinery.

The Missouri Portland Cement Co., International Life Building, St. Louis, is considering the installation of a new dust reduction system at its cement mills, estimated to cost in excess of $100,000.

The Kentucky Mine & Supply Co., Middlesboro, Ky., has awarded a contract to A. R. McMurray, Burwell Building, Knoxville, Tenn., for a one and two-story addition, to cost about $25,000.

The Clabron-Elkhorn Coal Co., Paintsville, Ky., recently organized, is planning for the construction of a new coal tipple at McDowell, Ky.

The Damascus Mfg. Co., Lawton, Okla., is planning for the erection of a refinery, as an extension to existing oil works recently acquired.

The Lexington Storage Battery Mfg. Co., Lexington, Ky., has been incorporated with a capital of $25,000 by M. B. Davis, H. Greenbaum and L. B. Speyer, to manufacture storage batteries and other electrical products.

The Cavanal Coal Co., 435 Ridge Building, Kansas City, Mo., recently organized with a capital of $500,000, is planning for the installation of machinery at Shady Point, Okla., to cost about $100,000, to include a tipple, hoisting, conveying and coal handling equipment.

The Dubois Rubber & Tube Co., Chattanooga, Tenn., has preliminary plans under way for its new plant for the manufacture of automobile tires.

The Jellico Brick Corporation, Newcomb, Tenn., recently organized with a capital of $100,000, has plans under way for the establishment of a local plant, with department for the manufacture of fire brick and other refractories. The machinery installation included pulverizing equipment, etc. Peter Zechini is president and general manager; Frank L. Smith is secretary-treasurer.

The Gulf States

BIRMINGHAM, Jan. 3.

In connection with rebuilding the portion of its plant recently destroyed by fire, with loss estimated at $900,000, the Jahncke Dry Dock & Shipbuilding Co., New Orleans, is arranging for the installation of additional drydock shop buildings, estimated to cost about $250,000. Paul Jahncke is vice-president.

The Wizard Machine Co., Tampa, Fla., recently formed with a capital of $100,000, has leased a local building for its proposed plant. Later it is planned to construct a new factory, providing for increased production. P. F. O'Keefe, 618 Florida Avenue, is secretary.

The Texas A. E. M. College, College Station, Tex., A. Bissell, president, is planning to rebuild its mechanical engineering department, recently destroyed by fire with loss estimated at about $75,000, of which $50,000 was in machinery.

The M. S. T. Shipbuilding Co., Tarpon Springs, Fla., has purchased waterfront property for the establishment of a shipbuilding and repair plant, primarily for vessels of light type.

Under the auspices of the Chamber of Commerce, Mineral Wells, Tex., the Mineral Wells Paving Brick Co. has been formed with a capital of $200,000. The proposed plant with machinery is estimated to cost about $100,000. A. E. Eaton, Fort Worth, Tex., is in charge.

The Port Houston Tire & Rubber Co., Houston, Tex., recently organized with a capital of $1,000,000 to manufacture automobile tires, has acquired the plant and property of the Universal Tire & Rubber Association, consisting of about 3 acres with factory. It is proposed to build additions for the production of mechanical rubber goods for oil well and other service. J. L. Poole is president; H. H. Allyn is vice-president and general manager.

The Grand Prairie Garage Co., Grand Prairie, Tex., is planning to rebuild its automobile service and repair works recently destroyed by fire with loss estimated at $90,000.

The Sherwood Automobile Co., Houston, Tex., recently organized with a capital of $350,000, has plans under way for a new service and repair building, two stories and basement, to cost about $75,000. A site has been purchased. W. C. Roberts is president and E. P. Maynard, secretary and treasurer.

Conveying machinery, hoisting and loading equipment will be installed by the National Export & Import Co., Iberville and Front streets, New Orleans, in connection with extensions and improvements in its seven-story building. F. J. Gruenthal is vice-president.

The World Refinery Co., Bridgeport, Tex., plans to build a refinery with a daily capacity of 2000 bbl.

The Mexia Refining Co., Mexia, Tex., will build a refinery with a daily capacity of 1000 bbl.

OFFICE CHANGES

The W. J. Baird Machinery Co., Detroit, Mich., has not changed its location, but through renumbering of Detroit streets has a new address of 409-411 Jefferson Avenue, E.

The Bessemer Limestone & Cement Co. has moved its general offices from 714 Stambaugh Building, Youngstown, Ohio, to a new office building at Bessemer, Pa., where the plant is located. The old quarters are retained, however, for maintenance of a Youngstown office, though the executive officers are located at Bessemer.

The G-H-P Mfg. Co., tools, jigs, fixtures, gages, Providence, R. I., has changed its address to Box 355, same city.

The Mesta Machine Co., Pittsburgh, announces the opening of a branch office at Chicago, temporarily located in the Railway Exchange Building, to be moved to permanent quarters in the McCormick Building after April 1. The Chicago office will be in charge of C. J. Mesta, 2nd, vice-president of the company. W. R. Dawson and R. W. Schutte will be transferred from the Pittsburgh offices to Chicago. The Mesta Machine Co. recently opened offices in the Singer Building, New York, in charge of M. M. Moore, who was formerly export sales manager located at Pittsburgh. Frank A. Mesta will also be transferred from the Pittsburgh office to the New York office as assistant to Mr. Moore. The company will retain its offices in the Munsey Building, Washington.

The Northern Engineering Works, crane and hoist builder of Detroit, has established a new office in the Pittsburgh district at 990 Union Arcade Building, in charge of J. B. Laird, who has hitherto represented the company in western New York and northern Pennsylvania. Mr. Laird is an experienced crane and hoist engineer and salesman and will cover the entire East and Ohio valley, and for the present will also look after the Buffalo district.

Current Metal Prices

On Small Lots, from Merchants' Stocks, New York City

The quotations given below are for small lots, as sold from stores in New York City by merchants carrying stocks.

As there are many consumers whose requirements are not sufficiently heavy to warrant their placing orders with manufacturers for shipment in carload lots from mills, these prices are given for their convenience.

On a number of articles the base price only is given, it being impossible to name every size.

The wholesale prices at which large lots are sold by manufacturers for direct shipment from mills are given in the market reports appearing in a preceding part of THE IRON AGE under the general heading of "Iron and Steel Markets" and "Metal Markets."

Iron and Soft Steel Bars and Shapes*

Bars:	Per Lb.
Refined iron, base price	4.25c.
Swedish bars, base price	20.00c.
Soft steel bars, base price	3.48c. to 3.70c.
Hoops, base price	4.18c. to 4.65c.
Bands, base price	4.18c. to 4.65c.
Beams and channels, angles and tees 3 in. x ¼ in. and larger, base	3.58c. to 3.80c.
Channels, angles and tees under 3 in. x ¼ in., base	3.48c. to 3.70c.

*The low prices are those of the Carnegie Steel Co. and are subject to a cartage charge of 15c. per 100 lb. in the Metropolitan district and 10c. per 100 lb. to local points in New Jersey.

Merchant Steel

	Per Lb.
Tire, 1½ x ½ in. and larger	3.75c.
(Smooth finish, 1 to 2½ x ¼ in. and larger)	4.25c.
Toe calk, ½ x ⅜ in. and larger	5.00c.
Cold-rolled strip (soft and quarter hard)	10.00c. to 10.50c.
Open-hearth spring steel	6.50c. to 8.00c.
Shafting and Screw Stock:	
Rounds	5.50c.
Squares, flats and hex	6.00c.
Standard cast steel, base price	15.00c.
Best cast steel	20.00c.
Extra best cast steel	25.00c.

Tank Plates—Steel

¼ in. and heavier	3.78c. to 4.00c.

Sheets

Blue Annealed

	Per Lb.
No. 10	4.68c. to 5.20c.
No. 12	4.73c. to 5.25c.
No. 14	5.00c. to 5.30c.
No. 16	5.10c. to 5.40c.

Box Annealed—Black

	Soft Steel C.R., One Pass Per Lb.	Wood's Refined, Per Lb.
Nos. 18 to 20	5.80c. to 6.30c.	.....
Nos. 22 and 24	5.85c. to 6.35c.	7.80c.
No. 26	5.90c. to 6.40c.	7.90c.
No. 28	6.00c. to 6.50c.	8.00c.
No. 30	6.25c. to 6.75c.	.....

No. 28, 36 in. wide, 10c. higher.

Galvanized

	Per Lb.
No. 14	6.35c. to 6.50c.
No. 16	6.60c. to 6.75c.
Nos. 18 and 20	6.75c. to 6.90c.
Nos. 22 and 24	6.90c. to 7.05c.
No. 26	7.05c. to 7.20c.
No. 27	7.20c. to 7.35c.
No. 28	7.35c. to 7.50c.
No. 30	7.85c. to 8.00c.

No. 28, 36 in. wide, 20c. higher.

Welded Pipe

Standard Steel	Blk.	Galv.	*Wrought Iron*	Blk.	Galv.
⅛ in. Butt...	—34	—17	¾-1½ in. Butt.	— 3	+17
¾-3 in. Butt..	—38	—22	2 in. Lap.....	+ 3	+21
3½-6 in. Lap.	—33	—18	2½-6 in. Lap...	+ 1	+17
7-12 in. Lap..	—23	— 6	7-12 in. Lap....	+12	+30

Steel Wire

BASED PRICE* ON NO. 9 GAGE AND COARSER	Per Lb.
Bright basic	5.75c.
Annealed soft	5.75c.
Galvanized annealed	6.50c.
Coppered basic	6.25c.
Tinned soft Bessemer	7.25c.

*Regular extras for lighter gages.

Brass Sheet, Rod, Tube and Wire

BASE PRICE

High brass sheet	22½c. to 23c.
High brass wire	23¼c. to 24c.
Brass rod	20¼c. to 23c.
Brass tube	38¼c. to 40c.

Copper Sheets

Sheet copper, hot rolled, 24 oz., 23½c. to 24½c. per lb. base.

Cold rolled, 14 oz. and heavier, 2c. per lb. advance over hot rolled.

Tin Plates

Bright Tin		Coke—14x20		
			Primes	Wasters
Grade "AAA" Charcoal 14x20	Grade "A" Charcoal 14x20	80 lb...	$8.80	$8.55
		90 lb...	8.90	8.65
		100 lb...	9.00	8.75
IC...$12.65	$11.65	IC...	9.25	9.00
IX... 14.45	13.45	IX...	10.25	10.00
IXX... 16.25	15.05	IXX...	11.25	11.00
IXXX... 17.85	16.65	IXXX...	12.25	12.00
IXXXX... 19.45	18.25	IXXXX...	13.25	13.00

Terne Plates

8-lb. Coating 14 x 20

100 lb.	$8.85
IC	9.00
IX	10.00
Fire door stock	12.00

Tin

Straits pig	37c.
Bar	42c. to 47c.

Copper

Lake ingot	16½c.
Electrolytic	16½c.
Casting	16½c.

Spelter and Sheet Zinc

Western spelter	7½c. to 8c.
Sheet zinc, No. 9 base, casks	13½c. open 14c.

Lead and Solder*

American pig lead	6c. to 7c.
Bar lead	7c. to 8c.
Solder, ½ and ½ guaranteed	27c.
No. 1 solder	24½c.
Refined solder	20½c.

*Prices of solder indicated by private brand vary according to composition.

Babbitt Metal

Best grade, per lb	80c.
Commercial grade, per lb	40c.

Antimony

Asiatic	7½c. to 8½c.

Aluminum

No. 1 aluminum (guaranteed over 99 per cent pure), in ingots for remelting, per lb....35c to 38c.

Old Metals

Dealers report no transactions over the holidays. Prices are generally unchanged. Dealers' buying prices are nominally as follows:

	Cents Per Lb.
Copper, heavy and crucible	10.50
Copper, heavy and wire	10.00
Copper, light and bottoms	8.25
Brass, heavy	6.50
Brass, light	4.75
Heavy machine composition	10.25
No. 1 yellow brass turnings	6.00
No. 1 red brass or composition turnings	8.25
Lead, heavy	3.50
Lead, tea	2.50
Zinc	3.00